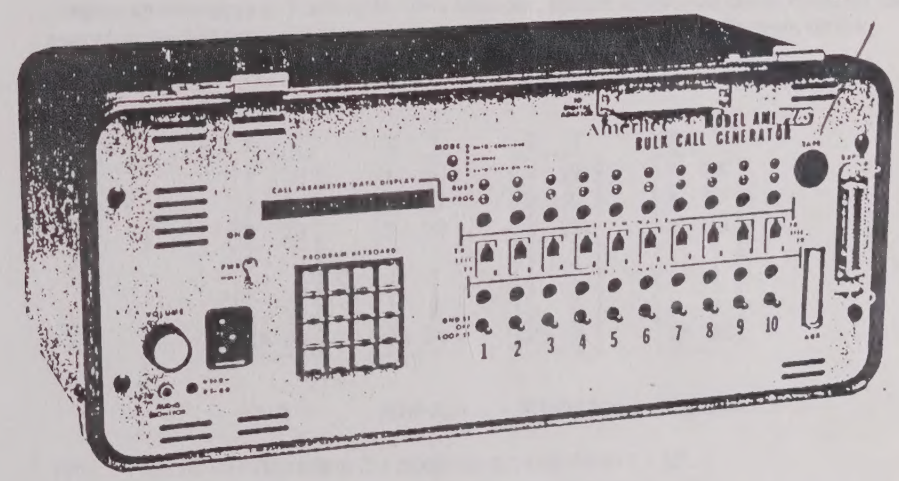
MODELS AM1 PLUS, AM1E PLUS, AM1EXT and AM1T1
BULK CALL GENERATORS

INSTRUCTION MANUAL

2800S



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MP MASTER
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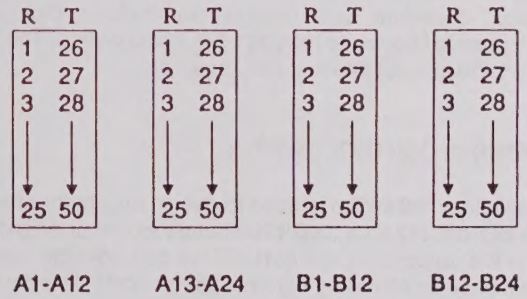
*** AM1-SP MANUAL ADDENDUM ***

AM1-SPA

The AM1-SPA Bulk Call Generator Is a specially packaged "PLUS" unit equipped with 48 loop start originate and 48 loop terminate ports. Because the functionality and line parameters are identical to the AM1PLUS-111, questions concerning the operation of this unit may be answered by referring to Section 5 of this manual.

Amphenol connectors. Each AM1-SPA has four, 50-pin amphenol connectors on the rear chassis that are used to connect to the lines under test. The diagram below describes their accompanying pin-outs:



Pins 1 - 12, 26 - 37 represent the originate pins for lines 1 - 12.
Pins 13 - 24, 38 - 49 represent the terminate pins for lines 1 - 12.

AM1-SPD

The AM1-SPD Bulk Call Generator is a specially packaged "PLUS" unit equipped with 4 T1span lines, providing 48 originate and 48 terminate channels. Because the functionality and line parameters are identical to the AM1PLUS-D11, questions concerning the operation of this unit may be answered by referring to Section 7 of this manual.

Note that the AM1-SPD is the sames as two AM1 PLUS-D11 units chained together, but with only four spans instead of six.

Bantam connectors . Connections to the 4 span lines of the AM1-SPD are made via the Bantam jacks on the front panel as with the first 2 spans of an AM1 PLUS-D11.

AM1-SP (A or D)

The packaging and control of the AM1-SP is unique in several ways when compared to the AM1PLUS. Each of these differences is explained in detail below:

1) FRONT PANEL KEYPAD

Each AM1-SP is equipped with two keypads used to enter/change line parameters as compared to the AM1PLUS which has only one keypad. The upper keypad is designed to control lines 1 - 24 and the lower keypad is designed to control lines 25 - 48.

2) REMOTE CONTROL & COMMAND ENTRY

The AM1-SP can best be described as two separate Basic units chained together within one package. Therefore, when issuing commands remotely either through the modem or from a terminal device to the AM1-SP, commands to the first 24 lines are preceded by an !A, the second 24 lines with an IB, etc.

3) MODEM/TERMINAL CONTROL SWITCH

The modem/terminal control switch is used to designate whether the AM1-SP is to be controlled via its internal 212 type, 300/1200 baud modem or an external terminal. With the switch in the up position, the AM1-SP will be under the control of its internal modem; the down position allows an external printer/controlling device to be connected to the unit. When controlling the AM1-SP through its modem, the four LED's above the modular jack have the following significance (from left to right):

A) Modem Ready B) Ring Indicator C) Carrier Detect D) Data Activity

It is important to note that if the RS232 output port is not being used on the first AM1-SP in the chain, the modem/terminal control switch should be in the modem (up) position to prevent the downloading of results to the RS232 print buffer.

4) CHAINING OF MULTIPLE UNITS

Each AM1-SP is equipped with two 25-pin RS232 connectors on the front panel. The male connector is used to connect to an external terminal or printer. The female connector is designed to connect to the male connector of the next unit so that multiple units can be operated together. For chaining multiple AM1-SP units together or an AM1XT/AM1PLUS to an AM1-SP, a straight pin RS232 cable is used. An empty female connector on the AM1-SP indicates the end of the chain. The modem/terminal control switch must be in the down position for all chained units.

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1. INTRODUCTION

1.01 MANUAL OVERVIEW

This instruction manual describes the Ameritec Corporation AM1 PLUS family of Bulk Call Generators.

The other paragraphs in this introduction section are:

1.02 Definition and Application
1.03 Types of AM1 PLUS Units
1.04 AM1 PLUS Features
1.05 Configuration Terminology

The balance of the manual is divided into the following sections:

2. Receiving and Unpacking
3. Power Considerations
4. Getting Acquainted with the AM1 PLUS
5. AM1 PLUS-1, Analog Basic Unit
6. AM1 PLUS-2, E&M Basic Unit
7. AM1 PLUS-D, T1 Basic Unit
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NOTE

Section 4, Getting Acquainted with the AM1 PLUS, covers basic operating procedures; it also gives an overall view of the AM1 PLUS with references to detailed information found elsewhere in the manual.

Manual Organization. General information is given in Section 4, "Getting Acquainted with the AM1 PLUS". Information that is specific to particular AM1 PLUS units is covered in Sections 5 thru 8. Sections 9 thru 11 describe in detail how to set parameters in preparation for a test run. Section 12 illustrates how to connect and configure AM1 PLUS units. Section 13 covers how to run a test and interpret the results. Section 14 shows the additional capabilites using the RS232 port option, especially test result printouts. Section 17, Ordering Information, lists the equipment available for the AM1 PLUS along with part numbers. Appendix D describes settings and adjustments that require front panel removal.

INTRODUCTION

1.02 DEFINITION AND APPLICATION

General. A Bulk Call Generator is a device designed to perform large-volume call traffic simulation on telephone switching machines. It is used in switch turn-up and cutover, in routine switch maintenance, and in simulating equal access interface characteristics between switches.

AM1 PLUS Units. The Ameritec Model AM1 PLUS Bulk Call Generator is a state-of-the-art call simulator. There are several AM1 PLUS models which may be used in a variety of configurations to place a controlled "load" on a switching system. The various units which comprise an AM1 PLUS system will allow for call origination (generation) and termination via loop start, ground start, 2 and 4-wire E&M, and digital T1 ports. The AM1 PLUS also includes the capability of originating and terminating calls under Feature Group C and D, Equal Access, conditions. This means that The AM1 PLUS may be used in both telco and inter-LATA environments for complete end-to-end testing of traffic originating and terminating at the different points.

Applications. Some of the many uses for AM1 PLUS Bulk Call Generators are listed below:

A. Installation and Cutover Stress Testing of PBX and Central Office Switching Systems
B. Design and Parameter Verification of Switching Systems
C. Network Testing
D. Billing System Integrity Testing
E. Testing of Various T1 Products
F. Equal Access Testing

The possible applications are virtually endless! This manual can only touch on some of them. See Section 15 for application notes on some of the aspects of operation.

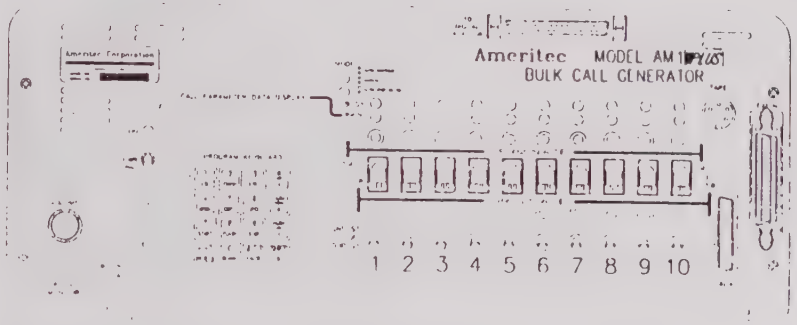
Users. Some of the types of organizations presently using the AM1 family of Bulk Call Generators are listed below:

A. Major Switch Manufacturers
B. Telephone Companies
C. Interconnect Companies
D. Inter-Lata Carriers
E. Installation and Service Organizations

1.03 TYPES OF AM1 PLUS UNITS

This manual describes a total of ten (10) AM1 PLUS/AM1E PLUS/AM1EXT units: four (4) "Basic Units", four (4) "Expansion Units" and two (2) "T1 Adaptor Units". Each of the units is available in either portable or rack mount. The Basic Units and T1 Adaptor Units have three (3) different input power options. Nine (9) of the AM1 PLUS units are illustrated in Figs. 1-1 thru 1-9 along with the model number and a brief description; the blanks in the Model Number represent option codes, explained in Table 1-1; see Sections 5 thru 8 for detailed descriptions of these units. The other (basic) unit, the AM1 PLUS 20/20, is illustrated and described in Section 19

1.03 TYPES OF AM1 PLUS UNITS, continued



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1 PLUS-1 _ _	10 loop start/ ground start	10 loop

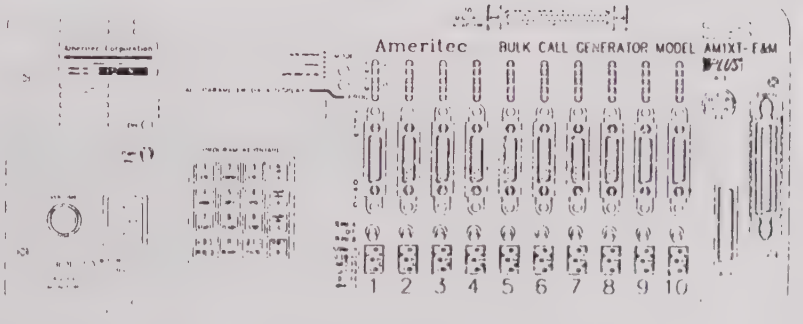
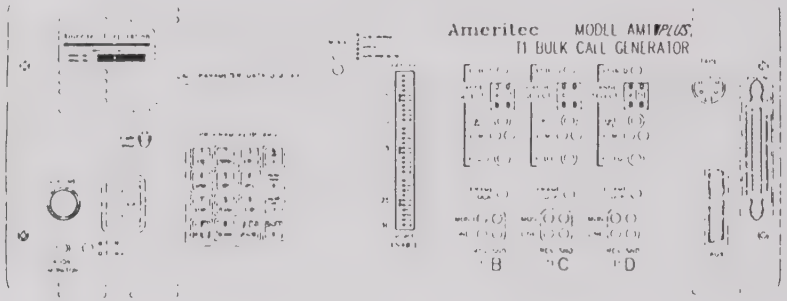
Figure 1-1. AM1 PLUS-1 Basic Unit

MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1 PLUS-2 _ _	10 2 or 4-wire E&M	10 2 or 4-wire E&M

Figure 1-2. AM1 PLUS-2 Basic Unit

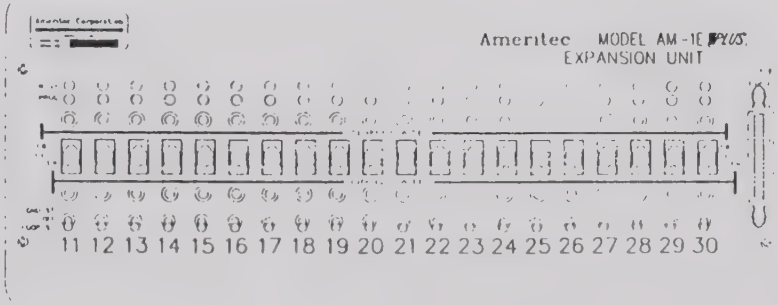
1.03 TYPES OF AM1 PLUS UNITS, continued



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1 PLUS-D _ _	Up to 30 Digital (T1) channels	Up to 30 Digital (T1) channels

Three (3) T1 span lines with 3x24 = 72 channels available

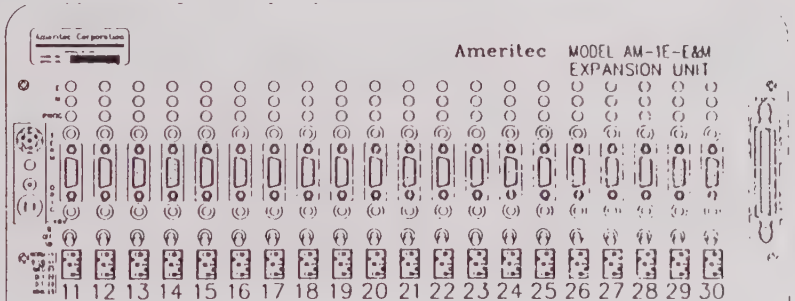
Figure 1-3. AM1 PLUS-D Basic Unit



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1E PLUS-1 _	20 loop start/ ground start	20 loop

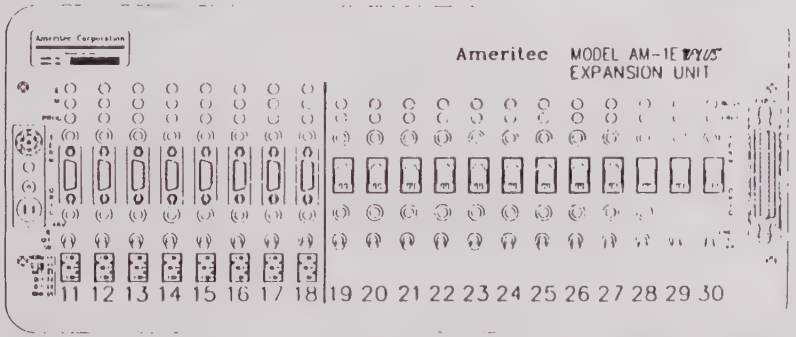
Figure 1-4. AM1E PLUS-1 Expansion Unit (Connect to a Basic Unit)

1.03 TYPES OF AM1 PLUS UNITS, continued



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1EXT-2 _ _	20 2 or 4-wire E&M	20 Loop

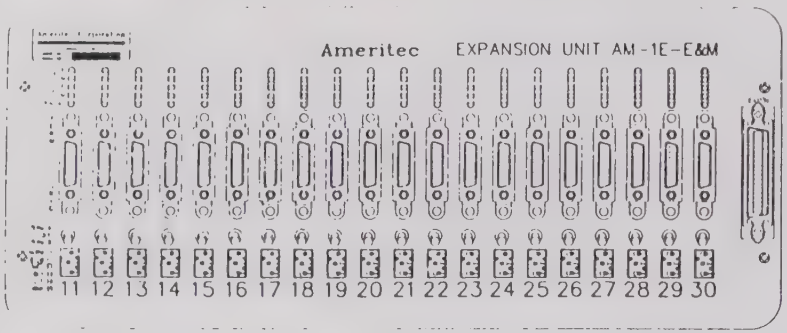
Figure 1-5. AM1EXT-2 Expansion Unit (Connect to a Basic Unit)



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1E PLUS-3 _ _	8 2 or 4-wire E&M 12 loop/ground start	20 Loop

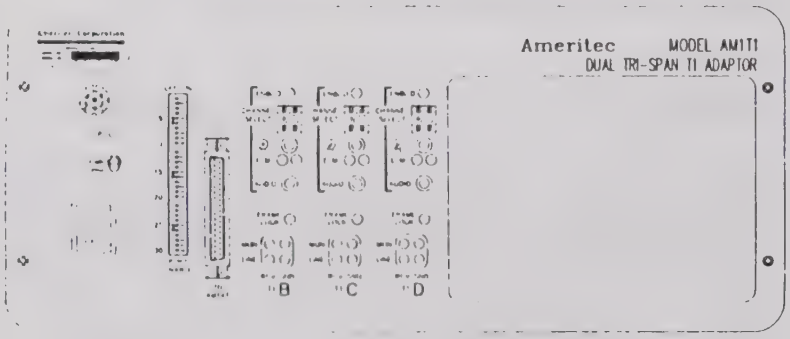
Figure 1-6. AM1E PLUS-3 Expansion Unit (Connect to a Basic Unit)

1.03 TYPES OF AM1 PLUS UNITS, continued



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1EXT-4 _ _	20 2 or 4-wire E&M	20 2 or 4-wire E&M

Figure 1-7. AM1EXT-4 Expansion Unit (Connect to a Basic Unit)

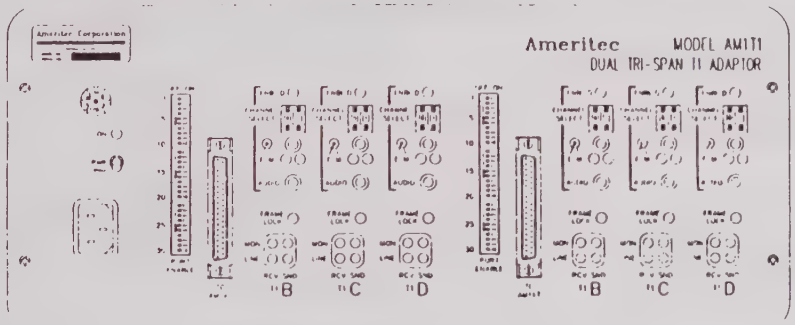


MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1T1-1 _ _	Up to 30 Digital (T1) channels	Up to 30 Digital (T1) channels

Three (3) T1 span lines with 3x24 = 72 channels available.
Connect to any Analog Basic Unit (AM1 PLUS-1 or -2).

Figure 1-8. AM1T1-1 Digital Adaptor Unit

1.03 TYPES OF AM1 PLUS UNITS, continued



MODEL NUMBER	ORIGINATE PORTS	TERMINATE PORTS
AM1T1-2 _ _	Up to 30 Digital (T1) channels per Set (2 Sets)	Up to 30 Digital (T1) channels per Set (2 Sets)

Equivalent to two (2) AM1T1-1 Units in a single package.

Total of six (6) T1 span lines. Three (3) T1 span lines with 3x24 = 72 channels available per each of the two (2) Sets.

Connect to any Two (2) Analog Basic Units (AM1 PLUS-1 or -2).

Figure 1-9. AM1T1-2 Digital Adaptor Unit

NOTE

Five (5) of the nine (9) units illustrated above are "PLUS" versions: all three (3) of the Basic Units and also the two (2) Expansion Units that have Loop Start/Ground Start Interface have "PLUS" versions. The other units are AM1EXT models which connect to and are compatible with the "PLUS" Basic Units. See Para. 12.03 for AM1 PLUS/AM1EXT interconnect rules.

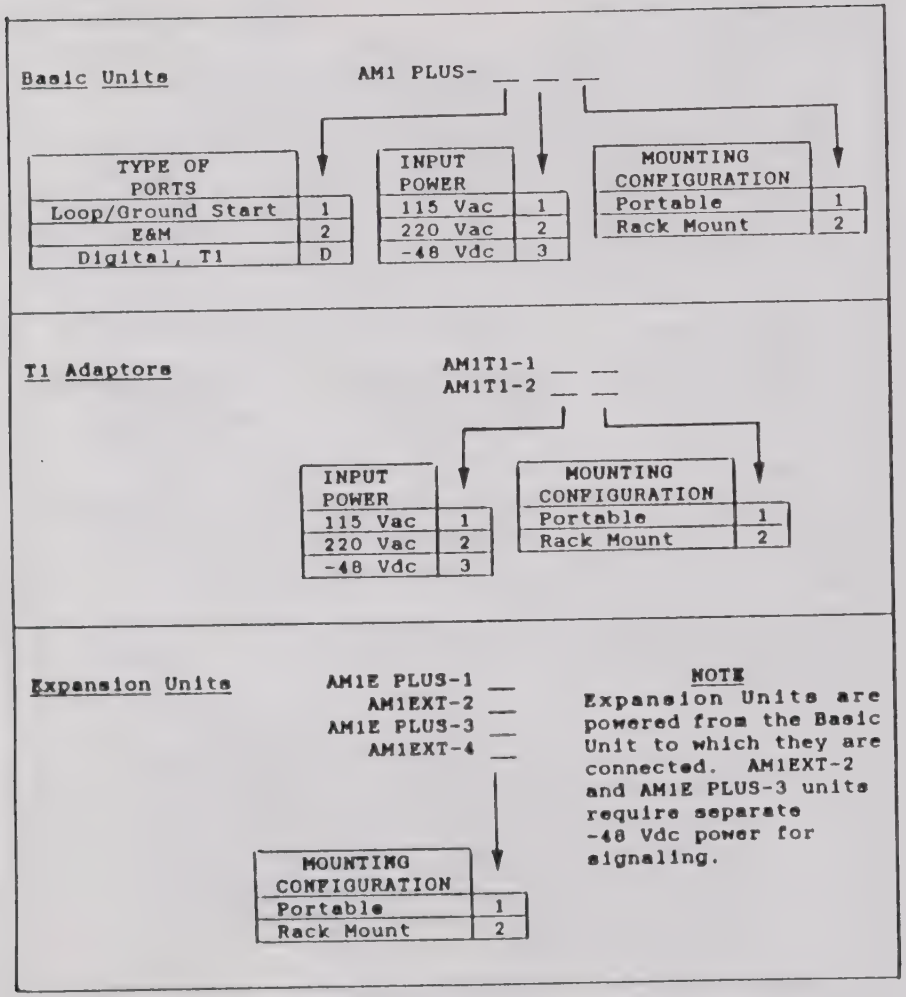
Model Number Coding. The AM1 PLUS units have Model Numbers which are coded to indicate respectively the type of ports, input power, and mounting configuration. Table 1-1 defines the coding.

EXAMPLES. Model AM1 PLUS-D12 is a Digital, T1 Basic Unit with 115 Vac input power and rack-mounted.

Model AM1 PLUS-131 is a Loop Start/Ground Start Basic Unit with -48 Vdc input power and portable.

1.03 TYPES OF AM1 PLUS UNITS, continued

Table 1-1
AM1 PLUS Model Number Coding



1.04 AM1 PLUS FEATURES

Construction. An AM1 PLUS unit contains a printed circuit (PC) board card file with the portable version housed within a rugged injection-molded plastic carrying case. The card file contains plug-in, PC boards which are installed behind a removable front panel. All electronic components are mounted on the PC Boards which can be easily removed for servicing; see Appendix D.

1.04 AM1 PLUS FEATURES, continued

Construction, continued. All indicators, controls and input/output connections are mounted on the PC boards and protrude through openings in the front panel. There are four (4) major PC board subassemblies in a Basic Unit. See Appendix D for details.

Product Improvement. The AM1 PLUS includes many new hardware and software enhancements compared to the previous Model AM1XT. See Appendix B for comparison of features between AM1 PLUS and AM1XT units.

The AM1 PLUS-1 and AM1E PLUS-1 can generate calls much faster than the AM1XT-1 and AM1EXT-1 because each line circuit card has its own on-board tone generator. The call rate was slowed down with the AM1XT-1 loop start/ground start unit oecause all lines shared a common tone generator.

EEPROM non-volatile memory locations have been added which make it possible to store four (4) different parameter and telephone number scenarios, any one of which can be programmed to be enabled when power is first turned on.

Several new Unit and Line Parameter prompts, Data Registers and Real Time Error Reports have been added to allow more programming control and more information with test results.

The AM1 PLUS also includes Two-Way Voicepath Confirmation of Unpaired Analog Lines which was an option in the earlier AM1XT units.

1.05 CONFIGURATION TERMINOLOGY

Units, Sets, and Systems. For purposes of this manual, an AM1 PLUS Basic "unit" configured with (or without) an AM1E PLUS Expansion "unit" and AM1T1 Adaptor "unit" will be considered a "set". Each set has a maximum capacity of 30 originate and 30 terminate ports. Multiple "sets" will be referred to as a "system". A "system" may consist of up to 15 "sets".

Call Volume. The maximum call volume of a Set is 30 originate and 30 terminate ports, regardless of the configuration of the set (single AM1 PLUS with or without an AM1E PLUS and/or AM1T1). Multiple AM1 PLUS sets consisting of AM1 PLUS units with or without AM1E PLUS and AM1T1 units may be "chained" for a system capacity of 450 originate and 450 terminate ports (30x15 = 450). In this large system configuration, all system commands and printouts can be achieved with one I/O device (i.e. printer, CRT, or Computer).

2. RECEIVING AND UNPACKING

2.01 INTRODUCTION

This section covers procedures to follow when an AM1 PLUS unit is first received in its shipping container:

2.02 Inspection when Received
2.03 Verification of Contents

2.02 INSPECTION WHEN RECEIVED

The AM1 PLUS was thoroughly tested and carefully packed before shipment and was in good condition when turned over to the carrier for transport.

The name of the carrier is noted on the packing slip which accompanied the shipment.

Upon receipt, thoroughly inspect the outside of the shipping container for damage. If the container is damaged, and the AM1 PLUS is found to be damaged or non-operational, immediately contact the carrier and submit a claim for damages.

NOTE

To test if unit is operational, see Section 3 for Power Considerations and Para. 4.11 for General Operation Notes.

2.03 VERIFICATION OF CONTENTS

Open the container carefully and compare the contents with the packing slip.

Note any damage or shortages. Notify the carrier in the event of damage. Notify Ameritec in the event of shortage.

See Section 17 for product descriptions and part numbers. Use Table 12-3 to confirm that standard cables are included.

Save the shipping container for future use in the event that the unit is returned to the factory.

3. POWER CONSIDERATIONS

3.01 INTRODUCTION

This section covers subjects associated with powering the AM1 PLUS. The paragraphs in this section are listed below:

3.02 Power Options
3.03 Power Cords, Power Connection and Fuses
3.04 Applying Power: "Cold" Start vs. "Warm" Start
3.05 Volatile and Non-Volatile Memory
3.06 Power Interruptions and Memory Backup Battery
3.07 Automatic Power-On Parameter Recall
3.08 Power Procedures with Expansion and T1 Adaptor Units

3.02 POWER OPTIONS

An AM1 PLUS Basic Unit or T1 Adaptor unit can be powered with one of three (3) possible power sources:

115 Vac 50/60 Hz
220 Vac 50/60 Hz
-48 Vdc

Refer to Table 1-1 with respect to AM1 PLUS Model Number Coding; also see the EXAMPLES of AM1 PLUS Model Numbers in Para. 1.03. Note that the input power is indicated by the second number (1, 2 or 3) after the dash in the Model Number.

The input power is also indicated on the Power Supply Assembly (see Fig. D-1 in Appendix D).

3.03 POWER CORDS, POWER CONNECTION AND FUSES

Power Cords. An appropriate power cord is supplied with each Basic Unit and T1 Adaptor Unit. The two (2) possible power cords are illustrated in Fig. 3-1. Model 48-0011 Power Cord is supplied with 115 Vac or 220 Vac units. Model 48-0043 Power Cord is supplied with -48 Vdc units.

Power Connection. Connect the Power Cord between the Basic Unit and the proper power source; see Para. 3.08 for power connection instructions with Expansion Units and T1 Adaptor Units. The power source should be a clean and stable source of the indicated voltage. Verify that the power source is not shared with motor-driven machinery and that it will not be switched off unintentionally by other personnel.

Fuses. In each Basic Unit, there is a fuse holder mounted internally on the right side of the Power Supply Assembly; see Fig. D-1 in Appendix D which shows the location of the Power Supply Assembly (under the front panel). There is a fuse holder (item 1 in Fig. 8-3) mounted externally on the left side of the front panels of T1 Adaptor Units and AM1EXT-2 and AM1 PLUS-3 Expansion Units. The values of the fuses are listed in Table 3-1.

3.03 POWER CORDS, POWER CONNECTION AND FUSES, continued

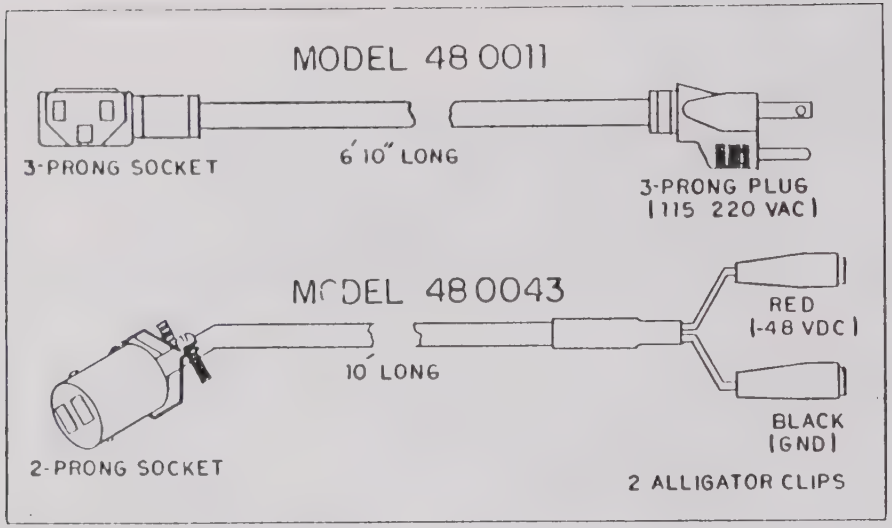


Figure 3-1. Power Cords

Table 3-1
Fuse Values

POWER SOURCE	FUSE
115 Vac 50/60 Hz	3 Amp
220 Vac 50/60 Hz	1 1/2 Amp
-48 Vdc	2 Amp

3.04 APPLYING POWER: "COLD" START VS. "WARM" START

Power Switch. There is a Power Switch on each Basic Unit and T1 Adaptor Unit (item 11 in Fig. 4-1). Before changing the setting of the Power Switch, pull on the Power Switch to release it from its detent. The detent prevents the power from being accidently switched OFF by inadvertently pushing on the switch.

NOTE

When not using the unit for an extended period of time, always leave the power switch OFF if the power cord is not connected. Failure to do so will discharge the Lithium Memory Backup Battery.

Cold Start: Power is applied to the AM1 PLUS by setting the Power Switch to ON. The Real Time Clock needs to be set to the actual time of day (Para. 9.02). The Parameters that come up (become active) are determined by the Power-On Recalls (Para. 9.10 and Para. 9.11).

3.04 APPLYING POWER: "COLD" START VS. "WARM" START, continued

Warm Start: Power is applied to the AM1 PLUS with the Power Switch already in the ON position:

1. When power is established again after a power failure or
2. By plugging in the power cord again after having previously disconnected the power cord with power applied to the unit.

The Backup Battery (described in Para. 3.06) preserves the Real Time Clock, Parameter settings and contents of the Data Registers that were in RAM at the time of power disconnection.

3.05 VOLATILE AND NON-VOLATILE MEMORY

Volatile Memories. Volatile Memory is preserved only when power is applied. The **RAM** and Clock are Volatile Memories with battery backup in the event of a power failure. The battery backup will only operate, however, if the Power Switch is left ON, as shown in Fig. 11-1. To preserve the Clock and the contents of the RAM when moving from one power source to another:

1. Leave Power Switch ON.
2. Unplug power cord from original power source.
3. Plug power cord into new power source ("warm start").

It is necessary to keep the Power Switch ON if it is desired to keep the Clock running and/or keep the contents of the Data Registers. The contents of the Data Registers cannot be stored in non-volatile memory and the Clock will always reset to the default value when the Power Switch is turned OFF.

Non-Volatile Memories. Non-Volatile Memory is preserved regardless of whether power is applied or not. The **EEPROM, EPROM** and **Cassette** are Non-Volatile Memories.

3.06 POWER INTERRUPTIONS AND MEMORY BACKUP BATTERY

The Backup Battery is a Lithium battery, located on the CPU/Memory/RTC board. This battery will provide a minimum of 500 hours of battery-backed memory. To preserve the Backup Battery, do not leave the Power Switch in the ON position, without power connected, for an extended period of time. See Para. D.05 for instructions to replace the Backup Battery.

The Backup Battery preserves the contents of the RAM (volatile memory) and keeps the Real Time Clock running during a power outage. The Backup Battery will only be connected if the Power Switch is ON, as shown in Fig. 11-1. The AM1 PLUS has auto-restart circuitry which causes it to resume operation when power returns ("warm start").

When the power fails or the power cord is disconnected, and the AM1 PLUS has an RS232 port, a Power Fail Report will be output giving the time and date of power loss and power return. See Para. 14.10,A.

3.07 AUTOMATIC POWER-ON PARAMETER RECALL

Before turning OFF the Power Switch, settings can be made to determine which Parameters and Telephone Numbers will automatically be written to RAM when the Power Switch is next turned ON ("cold start"); see Para. 9.10 and Para. 9.11. Any of the memory locations 0 thru 4 (Para. 11.06 and 11.07) can be chosen to be recalled when the Power Switch is turned ON. This feature is especially useful to:

1. Preset parameters before going to the field.
2. Store these parameters in certain EEPROM locations.
3. Set the Power-On Recall to recall these EEPROM locations.
4. When the AM1 PLUS is turned ON in the field, the same preset parameter settings will be enabled automatically.

Because of this Power-On Recall feature, there are not a fixed set of "default" Parameter and Telephone Number settings that will come up with a "cold start". The factory-set Parameter values will not necessarily come up when the Power Switch is first turned ON. Factory-set parameters, stored in EPROM, will only come up with a "cold start" when Power-On Recalls in Para. 9.10 and Para. 9.11 are set to "PWR RCL TEL 0" and "PWR RCL PARAM 0". Note that there are no Telephone Numbers (blank Dialed Number Fields) with "PWR RCL TEL 0". Parameter values with "PWR RCL PARAM 0" are the Recall "0" values of Sections 9 and 10.

3.08 POWER PROCEDURES WITH EXPANSION AND T1 ADAPTOR UNITS

This paragraph covers "cold start" and "warm start" power application for both Expansion Units and T1 Adaptor Units.

Expansion Units. Follow the procedure below for "cold start" power application to an Expansion Unit:

1. Be sure the Power Switch is OFF and connect the Power Cord between the Basic Unit and the power source.
2. Connect the Expansion Unit to the Basic Unit using the 48-0001 Ribbon Cable (Fig. 8-1)
3. For AM1EXT-2 and AM1E PLUS-3 Expansion Units:
   A. When the associated Basic Unit is AC powered, the three-prong AC cord, 48-0011 (Fig. 3-1), must be used in a GROUNDED receptacle.
   B. Connect to -48 Vdc for the signaling battery using the supplied 48-0043 Cable (Fig. 3-1); see Fig. 8-3, item 2, for plug contacts. This additional external -48 Vdc signal battery connection is required, regardless of the value of the power source of the Basic Unit.
4. Turn ON the power on the Basic Unit.

NOTE

Do not connect an Expansion Unit with the Basic Unit power ON; power surges would cause operational difficulties. To add an Expansion Unit after operation is started with a Basic Unit, see the "warm start" procedure below.

3.08 POWER PROCEDURES WITH EXPANSION AND T1 ADAPTOR UNITS, cont'd

Expansion Units, continued.

Follow the procedure below for "warm start" power application to an Expansion Unit:

1. Leave the Basic Unit power switch ON.
2. Disconnect the power cord from the power source.

NOTE

Steps 1 and 2 above maintain the active parameter settings in RAM using the Memory Backup Battery. The parameter settings would be lost if the power switch were turned OFF, unless they were first stored in non-volatile EEPROM memory (see Para. 11.09).

3. Connect the Expansion Unit to the Basic Unit using the 48-0001 Ribbon Cable (Fig. 8-1)
4. For AM1EXT-2 and AM1E PLUS-3 Expansion Units:
   A. When the associated Basic Unit is AC powered, the three-prong AC cord, 48-0011 (Fig. 3-1), must be used in a GROUNDED receptacle.
   B. Connect to -48 Vdc for the signaling battery using the supplied 48-0043 Cable (Fig. 3-1); see Fig. 8-3, item 2, for plug contacts. This additional external -48 Vdc signal battery connection is required, regardless of the value of the power source of the Basic Unit.
5. Reconnect the power cord to the Basic Unit.

T1 Adaptor Units. Follow the procedure below for "cold start" power application to a T1 Adaptor Unit:

1. Be sure the power switches are OFF on both the Basic Unit and the T1 Adaptor Unit.
2. Connect the power cords between the Basic Unit and its power source and between the T1 Adaptor Unit and its power source.
3. Connect the T1 Adaptor Unit to the Basic Unit using the 48-0056 T1 Adaptor Cable (Fig. 8-8).
4. First, turn ON the power on the T1 Adaptor Unit.
5. Then, turn ON the power on the Basic Unit.

NOTE

If the T1 Adaptor Unit power were turned ON after turning ON the Basic Unit power, the Basic Unit software would not recognize the presence of the T1 Adaptor.

3.08 POWER PROCEDURES WITH EXPANSION AND T1 ADAPTOR UNITS, cont'd

T1 Adaptor Units, continued.

Follow the procedure below for "warm start" power application to a T1 Adaptor Unit:

1. Be sure the T1 Adaptor Unit power switch is OFF.
2. Leave the Basic Unit power switch ON.
3. Disconnect the Basic Unit power cord from the power source.

NOTE

Steps 2 and 3 above maintain the active parameter settings in RAM using the Memory Backup Battery. The parameter settings would be lost if the power switch were turned OFF, unless they were first stored in non-volatile EEPROM memory (see Para. 11.09).

4. Connect the power cord between the T1 Adaptor Unit and its power source.
5. Connect the T1 Adaptor Unit to the Basic Unit using the 48-0056 T1 Adaptor Cable (Fig. 8-8).
6. First, turn ON the power on the T1 Adaptor Unit.
7. Then, reconnect the power cord to the Basic Unit.

NOTE

If the T1 Adaptor Unit power were turned ON after reconnecting the power cord to the Basic Unit, the Basic Unit software would not recognize the presence of the T1 Adaptor.

4. GETTING ACQUAINTED WITH THE AM1 PLUS

4.01 INTRODUCTION

This section describes the physical features that are common to all Basic Units and explains the basic functions of the AM1 PLUS. Also, general operation techniques are covered which are used to make Parameter settings, STORE/RECALL Parameter settings, START and STOP the unit, and read the test results. Paragraph references are given of detailed information found elsewhere in the manual.

The paragraphs in this section are listed below:

4.02 General
4.03 Component Location
4.04 Connectors
4.05 Keyboard Functions
4.06 Display
4.07 Light-Emitting Diodes (LEDs)
4.08 Switches
4.09 Speaker and Volume Control
4.10 Options: RS232 Port and Cassette Interface
4.11 General Operation Notes and Techniques

4.02 GENERAL

NOTE

See Sections 5 thru 8 and 19 for information that is unique to individual units. This section covers general information only.

Types of Units. There are ten (10) different types of AM1 PLUS and AM1EXT units as illustrated in Fig. 1-1 thru 1-9 and Fig. 19-1. There are four (4) types of Basic Units which are described individually in Sections 5 thru 7 and 19. The four (4) Expansion Units and two (2) T1 Adaptor Units are described in Section 8. Except for the AM1 PLUS 20/20, each Basic Unit has a capacity of controlling call generation over 30 dual-port lines -- 30 Originate Ports and 30 Terminate Ports. All connections and functions for all units are on the front panel.

AM1 PLUS Functions. See Para. 4.05, Keyboard Functions, for a summary of all the functions that:

A. Can be entered into the Dialed Number Field
B. Are used to control entry of Unit and Line Parameters
C. Command the unit to start, finish, stop, printout, store, recall, etc.

Parameter Settings and Telephone Numbers. There are a great variety of different user-controlled parameter settings to tailor the AM1 PLUS to the application. Unit Parameters (Section 9) affect all lines. Line Parameters (Section 10) are programmed individually for each line. The Telephone Number of each line is one of the Line Parameters. The "Telephone Number" is actually a Dialed Number Field (Para. 10.06) with a possible 128 digits which not only cause digits to be outpulsed but can also command various events in the process of a Call Sequence (Para. 13.04). See Fig. 4-3 for lists of all Parameters and Data Registers.

4.02 GENERAL, continued

Copy and Store/Recall. Line Parameter settings can be copied from one line to another line or to all the other lines (Para. 10.30). Up to four (4) sets of user-programmed Parameter settings and Telephone Numbers can stored/recalled in EEPROM (Para. 11.09 and 11.10). Standard Factory Settings for all the Parameters can be recalled from EPROM (Para. 11.10).

Testing and Test Results. See Para. 13.03 for instructions to START testing and Para. 13.06 to end (FINISH and STOP) testing. The test results are recorded in the Data Registers (Para. 13.07 thru 13.17).

Basic Operation Techniques. Follow the instructions in Para. 4.11 to become familiar with basic operation of the AM1 PLUS.

4.03 COMPONENT LOCATION

An AM1 PLUS-1 Basic Unit is shown in Fig. 4-1: only the components that are common to all Basic Units are called out.

Serial Number Coding. The Serial Number on the Identification Label (item 13 in Fig. 4-1) is a six-digit number, coded as follows:

first two digits = week (01 thru 52) of manufacture
second two digits = year of manufacture
third two digits = identification number (00 thru 99) to distinguish between units

EXAMPLE: A unit with Serial Number 118847 was manufactured the 11th week of 1988.

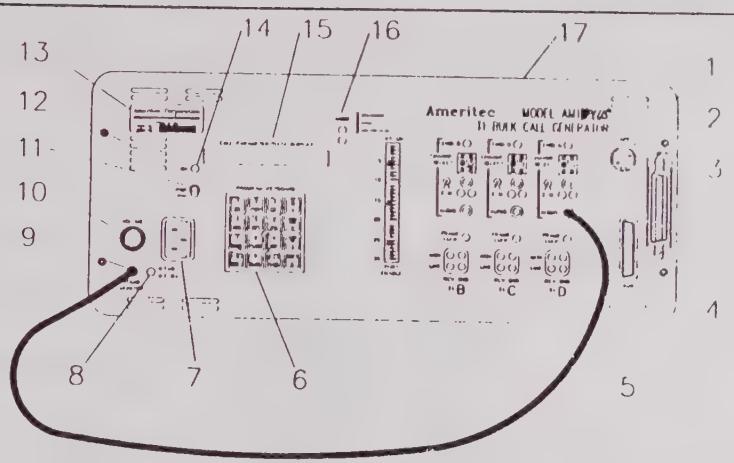
4.04 CONNECTORS

See Fig. 4-1 (items 1, 3, 4, 7, 9) for descriptions of the different connectors common to all basic units.

Concerning the Power Connector, all Basic Units and the T1 Adaptors can be ordered to operate with one of three (3) power sources: 115 Vac, 220 Vac, or -48 Vdc; see Para. 3.02.

There is a Digital Adaptor Connector on the AM1 PLUS-1 and AM1 PLUS-2 units for connecting a T1 Adaptor. See Fig. 5-1 and 6-1.

The Line Connectors are different for each type of Basic Unit; see Fig. 5-1, 6-1 and 7-1. There are optional adaptors which mount on the front panel or in a separate rack mount panel to bring the Line Connectors to an Amphenol connector(s) for convenient connect/disconnect; see Para. 5.08 and Para. 6.08.



1 **CASSETTE INTERFACE.** 5-pin circular DIN female connector. Only on units equipped with Option 28-0005.

2 **FRONT PANEL SCREWS (4).** Remove these screws to take off the Front Panel. See Appendix D.

3 **EXPANSION CONNECTOR.** 18-pair female Amphenol to connect an expansion unit. Mating ribbon cable (48-0001) supplied with each expansion unit.

4 **RS232 CONNECTOR.** 25-pin male DB25. Only for units equipped with Option 28-0005, Option 28-0006 or Option 28-0079 (see Para. 4.10).

5 **AUDIO PATCH CORD (48-0009).** 2-foot Bantam-to-Bantam cable, supplied. Drawing shows typical audio patch.

6 **KEYBOARD.** 16-Key pad by which all entries and commands are made.

7 **POWER PLUG.** 115 or 220 Vac = 3-pronged male. -48 Vdc = 2-pronged male. Mating power cord supplied.

8 **POLARITY LED,** green. Indicates polarity of Tip and Ring of Audio Monitor signal. Lights when Tip positive (+) compared to Ring.

9 **AUDIO MONITOR JACK.** Bantam Jack. To listen to activity at either an Originate Port or Terminate Port. Mating 2' Bantam-to-Bantam cord supplied.

10 **VOLUME CONTROL KNOB.** Adjusts level of Speaker sound of line being monitored at Audio Monitor jack.

11 **POWER ON/OFF SWITCH.** Pull to release safety catch before setting.

12 **SPEAKER.** Sound from line being monitored at Audio Monitor Jack.

13 **IDENTIFICATION LABEL.** Model Number and Serial Number.

14 **POWER ON LED,** green.

15 **DISPLAY.** 16-Character (7-segmented) red LED field.

16 **MODE LEDs,** red. Indicate Mode of Operation (3 possible modes). Abbreviation TBL = Trouble.

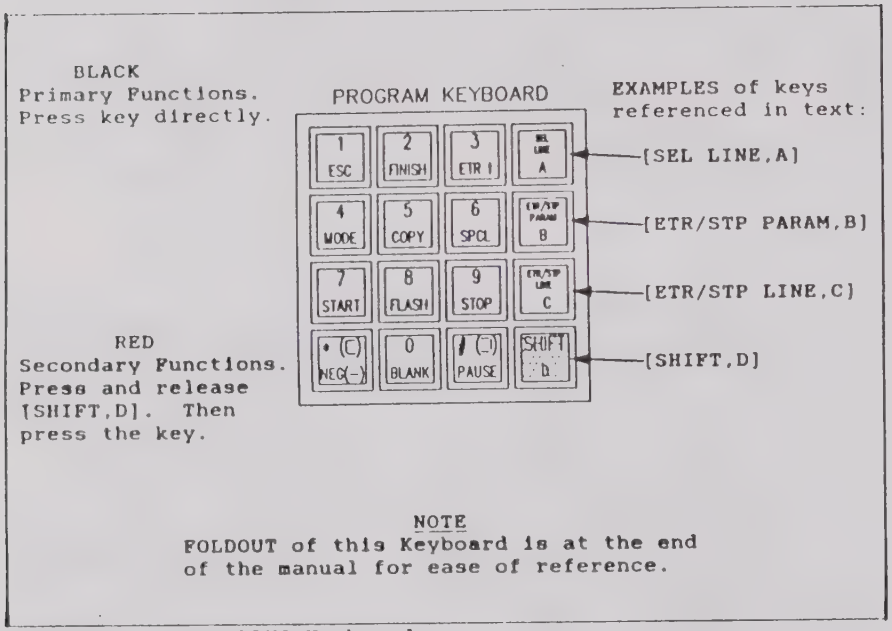
17 **CASE,** black. Injection-molded high-impact plastic for portable models only.

Figure 4-1. Typical AM1 PLUS Basic Unit, Component Location

4.05 KEYBOARD FUNCTIONS

NOTE

See Fig. 14-4 for correspondence between the keys on the AM1 PLUS and the keys on a terminal keyboard when using the RS232 port.



NOTE

FOLDOUT of this Keyboard is at the end of the manual for ease of reference.

Figure 4-2. AM1 PLUS Keyboard

General. Refer to Fig. 4-2 for the locations of the 16 keys. Each key on the AM1 PLUS keyboard performs two (2) different functions, labeled with different colors.

The UPPER function of each key is written in BLACK; these are called PRIMARY FUNCTIONS. To access one of these functions, press its key directly.

The LOWER function of each key is written in RED; these are called SECONDARY FUNCTIONS. To access one of these functions:

1. Press [SHIFT,D].
2. Press the appropriate key.

NOTE

All numbers are primary functions. All letters are secondary functions.

In this manual, keys are written with square brackets in the form: [primary function, secondary function]; see Fig. 4-2 for some examples.

4.05 KEYBOARD FUNCTIONS, continued

Primary Functions. The primary functions (black) of the keys are listed below, according to how they are used.

A. Dialed Number Field Entries (see Para. 10.06)

KEY	FUNCTION
1	Digit 1
2	Digit 2
3	Digit 3
4	Digit 4
5	Digit 5
6	Digit 6
7	Digit 7
8	Digit 8
9	Digit 9
0	Digit 0
* (⌐)	Digit *, KP (appears as "⌐" in display)
# (¬)	Digit #, ST (appears as "¬" in display)

B. Control Functions for Parameter Entry (Sections 9 and 10)

KEY	FUNCTION
SEL LINE	Select line to display or program parameters. See Para. 10.01. Also used as an "OOPS" key when a mistake is made in parameter entry.
ETR/STP PARAM	EnTeR new setting and STeP to next PARAMeter prompt on same line.
ETR/STP LINE	EnTeR new setting and STeP to same parameter of next LINE.

C. Key to Access Secondary Functions

KEY	FUNCTION
SHIFT	Enables secondary (red) function on next key pressed. Therefore, entire key shaded red.

4.05 KEYBOARD FUNCTIONS, continued

Secondary Functions. The secondary functions (red) of the keys are listed below, according to how they are used. There are four (4) double secondary functions using the [1,ESC] key; press [SHIFT,D] first before each secondary function key.

REMEMBER
Press [SHIFT,D] before pressing these keys in order to access the secondary function.

A. Dialed Number Field Entries (see Para. 10.06)

KEYS	FUNCTION
A	Digit A (DTMF or MF) or, if used as first digit of Dialed Number Field for a T1 port, emulates FXO Ground Start signaling. See Para. 15.06. "A" is not outpulsed when it is the first digit.
B	Digit B (DTMF or MF)
C	Digit C (DTMF or MF)
D	Digit D (DTMF) or, if used as first digit of T1 port, will cause that port to Delay start dial until the "M" lead drops. "D" is not outpulsed when it is the first digit.
ESC (E)	Commands a temporary ESCAPE from the dialed number to look for Confirmation Tone as programmed by the CONF TONE parameter (**Paired Mode**), Para. 10.12, or O-T TONE parameter (**Unpaired Mode**), Para. 10.13. Appears as an "E" in the Dialed Number Field.
ESC, ESC (EE)	Stop dialing and wait for 1000 Hz tone (milliWatt). Appears as "EE" in Dialed Number Field.
ESC, A (EA)	Stop dialing and unbalance the line by placing a ground on the Ring connection for 500ms. Appears as "EA" in Dialed Number Field.
ESC, B (EB)	Toggle to next Dialing Mode. Appears as "Eb" in Dialed Number Field. The Dialing Mode sequence for the toggle is listed below: 1 = Touch Tone (TT), by common tone generator 2 = Dial Pulse (DP) 3 = Multi-Frequency (MF) 4 = Touch Tone (TT), using tone generator on line card for AM1 PLUS-1 and AM1E PLUS-1 or 4 = Digital Multi-Frequency (DMF), with AM1 PLUS-D or AM1T1 units. NOTE: The Dialing Mode prompt, Para. 10.19, does not indicate mode "4" dialing as listed above, but it is still part of the toggle sequence.

4.05 KEYBOARD FUNCTIONS, continued

Secondary Functions, continued

A. Dialed Number Field Entries (see Para. 10.06), continued

KEYS	FUNCTION
ESC, C (EC)	Stop dialing and wait for a WINK of 100 ms minimum duration. See Para. 15.05 for use of wink for Direct Inward Dialing (D.I.D.) testing. Appears as "Ec" in Dialed Number Field.
FLASH (F)	Generate programmable hook FLASH (momentary on-hook), the duration of which is set with the "FLASH TIME" prompt; see Para. 10.28. Appears as "F" in Dialed Number Field.
NEG (-) (-)	Programmable WAIT (01 to 50 seconds) in dialing and, if used as first digit, will also override the initial automatic pause-for-Dial-Tone or pause-for-WINK. When used as first digit, outpulsing will start after the WAIT time; no Start Dial signal is required; this is referred to as "Immediate" start dial. See Para. 9.08 for Unit Parameter to program WAIT time. Appears as "-" in Dialed Number Field.
BLANK	Dialing is terminated at the first BLANK in the telephone number. If any digits were entered after the BLANK, they would not be output. If a break is desired in the dialed number sequence, enter a "-", WAIT, in the Dialed Number Field. The length of a call can be increased using Conversation Time; see Para. 10.26. Appears as blank space in Dialed Number Field.
PAUSE (P)	Wait for Dial Tone, wherever this is inserted in the Dialed Number sequence. Appears as a "P" in the Dialed Number Field. There is an automatic Wait-for-Dial-Tone before the Dialed Number Field of an Analog Originate Port (therefore no need to have a "P" as first digit for this case). For T1 Originate Ports, however, since the automatic Start Dial Signal is a WINK, if the T1 Originate Port is Dial Tone start, enter a "P" as the first digit.

4.05 KEYBOARD FUNCTIONS, continued

Secondary Functions, continued

B. Control Functions for Parameter Entry (Sections 9 and 10)

KEY	FUNCTION
ETR ↑	EnTeR new setting and return to previous parameter prompt. Also used as an "OOPS" key to exit a prompt when a mistake is made in parameter entry; [ETR/STP PARAM,B] is then pressed to return to the original prompt and the correct value is written over the incorrect entry.
MODE	Toggle to next Operating Mode. See Para. 13.02 for details. The Operating Mode sequence for the toggle is listed below: 1 = Automatic Continue 2 = Automatic Stop on Trouble (TBL) 3 = Manual The present Operating Mode is shown by the MODE LEDs above and to the right of the display. The Call Generation Mode prompt will appear on the display; Synchronous or Random Mode can be chosen; see Para. 9.04. If the AM1 PLUS is running, executing the MODE function will cause the unit to STOP.
COPY	Copies Line Parameters from one selected line to another. See Para. 10.30 for details.
NEG (-)	Used to enter a negative value when programming Touch Tone (DTMF) or MF Low and High Frequency Offset. See Para. 10.20 and 10.21.

C. Commands

KEY	FUNCTION
FINISH	Ends call generation of all lines at completion of the calls in progress. Unpaired Terminate Ports will answer calls in the FINISH mode; See Para. 13.06.

NOTE

The SPECIAL FUNCTIONS (SPCL) listed on the next page are all implemented as follows:

1. Press [SHIFT,D] [6,SPCL]
2. Press key of desired number, [0] thru [7]
   or
   Press [SHIFT,D], then key of desired letter: [A], [B], [C] or [D].
3. Press [ETR/STP PARAM,B] to execute

4.05 KEYBOARD FUNCTIONS, continued

Secondary Functions, continued

C. Commands, continued

KEYS	FUNCTION
SPCL, 0	This accesses a prompt to choose between normal mode of operation or a special mode of operation for Analog ports. The two possible entries in the prompt are listed below: TYPE 0 = Normal mode of operation TYPE 8 = Analog Unpaired Mode with 2-way Voicepath Confirmation Checks. See Para. 15.08 for details.
SPCL, 1	Print Parameters and Data Registers of selected line. See Fig. 14-7 for example printouts.
SPCL, 2	Print Parameters and Data Registers of all lines. See Para. 14.09,B.
SPCL, 3	Print Data Registers only of all lines. See Para. 14.09,C.
SPCL, 4	Clear (reset to 00000) all Data Registers (Para. 13.02).
SPCL, 5	Clear (reset to 00000) Data Registers of selected line (Para. 13.02).
SPCL, 6	Read (recall) Parameters and Telephone Numbers from Cassette Tape into RAM memory. See Fig. 11-1 and Para. 11.08 for details.
SPCL, 7	Write (store) Parameters and Telephone Numbers from RAM memory onto Cassette Tape. See Fig. 11-1 and Para. 11.08 for details.
SPCL, A	This accesses two (2) prompts to STORE Telephone Numbers and Parameters in EEPROM memory. See Para. 11.09 for details.
SPCL, B	This accesses two (2) prompts to RECALL Telephone Numbers and Parameters from EPROM or EEPROM memory. See Para. 11.10 for details.
SPCL, C	Open Alarm Contacts (only if unit were equipped with an Alarm Option).
SPCL, D	This accesses a prompt (PRINT STORE NO 9) to select the non-volatile memory location from which to PRINT out both the stored Parameters and Telephone Numbers. See Para. 14.09,D.

4.05 KEYBOARD FUNCTIONS, continued

Secondary Functions, continued

C. Commands, continued

KEY	FUNCTION
START	Start the automatic calling sequence if in an automatic mode of operation or initiate the next event in the call sequence if in Manual mode. Also used to continue from auto-stop on trouble. See Para. 13.03 for details.
STOP	Immediately STOP the auto calling sequence. Terminate ports will not answer when the unit is in Stopped Mode. See Para. 13.06.

4.06 DISPLAY

Physical. The Display is item 15 in Fig. 4-1. It is a red LED field with 16 characters, each with 7 segments. The prompts that appear on the Display are "pseudo-alpha" because of the limitations of the 7-segmented characters. Illustrations are given throughout the manual of the actual displays. Below the illustration of each display is written the same display as it appears, typed out, on a terminal monitor (CRT) or printout. Note that two (2) of the Data Register display readings (AVG DT and AVG PD) have a decimal point.

Special Function Displays. Press [SHIFT,D] [6,SPCL] to access a Special Function; the prompt "SPCL FUNCTION 1" appears; in most cases, the Special Function is executed directly from this display. In some cases, however, there are additional prompts, as listed below; see referenced paragraphs for more information.

SPCL FUNCTION 0	SPCL FUNCTION A	SPCL FUNCTION B	SPCL FUNCTION D
TYPE 0	STORE TEL NO 9	RECALL TEL NO 9	PRINT STORE NO 9
	STORE PARAM 9	RECALL PARAM 9	
(Para. 15.08)	(Para. 11.09)	(Para. 11.10)	(Para. 14.09,D)

Unit and Line Parameter Displays. These are listed in Fig. 4-3. To access these displays, see "Line Select Prompt" in Para. 4.11.

4.07 LIGHT-EMITTING DIODES (LEDs)

General. LEDs common to all basic units are listed below. See Fig. 4-1 for location of items referenced in this paragraph.

A. Power ON LED, green (item 14).
B. Mode LEDs, two (2) red (item 16); see Para. 9.03.
C. Polarity LED, green (item 8). This will light when the Audio Monitor Tip is positive (+) with respect to the Ring. It will be out if the Tip is negative (-) with respect to the Ring.

Particular. Other LEDs (labeled PROG, BUSY, E, M, ENBL'D, FRAME LOCK) are related to Line activity, which varies according to the type of unit. See Para. 5.03, 6.03, 7.03 and 8.04,A for details.

4.08 SWITCHES

Front Panel Switches. The Power ON/OFF switch is the only switch common to all basic units. Other switches are listed below:

A. Analog Loop/Ground Start Line Enable Toggle Switches on AM1 PLUS-1, AM1E PLUS-1, and AM1E PLUS-3 units. See item 7 in Fig. 5-1.
B. E&M Line Enable Toggle Switches on AM1 PLUS-2 and AM1EXT-2 units. See item 8 in Fig. 6-1, and item 9 in Fig. 8-3. Section 6.
C. Port Enable DIP switches on AM1 PLUS-D and AM1T1 units. See item 1 in Fig. 7-1.
D. Send/Receive Gain DIP switch and Call Initiation DIP switches on AM1 PLUS-2 and AM1EXT-2 units. See items 9 and 10 in Fig. 6-1, and items 10 and 11 in Fig. 8-3.

Switches Behind the Front Panel. There are address DIP switches on each Line Card that are set (if a new card is installed) according to the number of the slot in which the card is installed. Also there is a DIP switch on some RS232 Interface Boards to set the Stop Bits, Parity and Baud rate. See Appendix D for details.

4.09 SPEAKER AND VOLUME CONTROL

See Fig. 4-1 for location of items referenced in this paragraph. Use the Volume Control (item 10) to adjust the level of the sound coming from the Speaker (item 12) of the line being monitored at the Audio Monitor Jack (item 9).

See Para. 13.05 under "Audio Monitor" for more information.

4.10 OPTIONS: RS232 PORT AND CASSETTE INTERFACE

The RS232 Port and Cassette Interface are options in addition to the standard AM1 PLUS.

In Fig. 4-1,
RS232 Port is item 4
Cassette Interface is item 1

The RS232 Port is used to
A. Control the AM1 PLUS from an external terminal
B. Deliver printouts to a terminal monitor and/or printer
C. Chain together up to 15 AM1 PLUS sets
See Section 14 for details.

The Cassette Interface is used to STORE and RECALL Parameter settings and Telephone Numbers to and from a cassette tape. See Para. 11.08 for details.

Option Numbers. The numbers of the options are listed below:
A. Option 28-0005. RS232 Port and Cassette Interface
B. Option 28-0006. RS232 Port
C. Option 28-0079. RS232 Interface Card with Baud rate and Parity, programmed with Unit Parameter prompts; see Para. 9.14 and Para. 9.15.

4.11 GENERAL OPERATION NOTES AND TECHNIQUES

Practicing Basic Operation Techniques. A true "self test" cannot be done with the AM1 PLUS because an external line is needed to supply functions required for call generation: for example, -48 Vdc (to supply loop current), a T1 Pulse Code Modulated signal, Start Dial signal, etc. However, the basic operation techniques, all associated with the keyboard and display, can be practiced without any external connections. Follow the instructions below to become familiar with these basic operation techniques.

Setting Real Time Clock, the First Unit Parameter. Plug in the Power Cord and Turn ON the power. The Real Time Clock prompt (CLOC 0000-010100) will appear on the Display. See Para. 9.02 for an illustration of the display and some example entries. Enter the time as follows:

1. Press appropriate number keys to enter the present 24-hour time, month, day and year. The cursor will step to the right to the next character after each entry. If a mistake is made, see the last paragraph in this section, "Correcting Mistakes".
2. Press [ETR/STP PARAM,B] to:
   A. Start the Real Time Clock running from the time entered in Step 1.
   B. Step to the next Unit Parameter prompt (MODE AC=1 AS=2 1), explained in Para. 9.03.

Power ON Parameter Values. There are no fixed "default" parameter values that come up with power ON. The values that come up are determined by two (2) Unit Parameter settings which are illustrated and explained in Para. 9.10 and Para. 9.11.

After setting the Real Time Clock, repeatedly press [ETR/STP PARAM,B] and observe the displays appear which are illustrated in Para. 9.03 onward (also listed in Fig. 4-3).

A. Note the number entered in the prompt of Para. 9.10 (PWR RCL TEL 1). This indicates the memory location of the Telephone Numbers that were written into the active parameter settings (in RAM) when power was applied.
B. The number entered in the prompt of Para. 9.11 (PWR RCL PARAM 0) indicates the memory location of the Unit and Line Parameters that were written into the active parameter settings (in RAM) when power was applied.

Refer to Para. 11.02 for more information about parameter values stored in memory locations and how they relate to the application of power.

EXAMPLE: Setting a Unit Parameter

1. Continue to press [ETR/STP PARAM,B], stepping through the Unit Parameters, until the first Unit Parameter prompt, the Real Time Clock, appears again, shown in Para. 9.02.
2. Press [ETR/STP PARAM,B] once again.
3. The Operating Mode prompt (MODE AC=1 AS=2 1) will appear.
4. Observe the MODE LEDs above and to the right of Display.
5. Press [3] [ETR/STP PARAM,B].
6. Observe MODE LEDs again; note that MANUAL mode now set.
7. Press [SHIFT,D] [3, ETR ↑] to return to previous prompt.
8. Press [1] [ETR/STP PARAM,B] to change MODE to Auto Cont.

4.11 GENERAL OPERATION NOTES AND TECHNIQUES, continued

Line Select Prompt. There is another prompt, the Line Select prompt, that:

A. Indicates the set of parameter prompts (Unit or Line) that are presently selected and
B. Can be used to go to any other set of parameter prompts.

Press [SEL LINE,A]. The prompt LINE 00 will appear; this is the Line Select Prompt, illustrated in Para. 9.01. Unit Parameters are located on Line 00. Press [ETR/STP PARAM,B] again and note that the Real Time Clock prompt again appears.

NOTE

The Line Select Prompt can be accessed immediately by pressing [SEL LINE,A] from any display. To go to a different set of parameters:

1. Enter "00" to access Unit Parameters
   or
   Enter number ("01" thru "30") of desired line to access Line Parameters.
2. Press [ETR/STP PARAM,B] to go the first prompt of the desired line.

Line Parameters. Access the Line Parameters for Line 1:

1. Press [SEL LINE,A]
2. The Line Select prompt, LINE 00, will appear on the display.
3. Press [0] [1] [ETR/STP PARAM,B].
4. The Line Enable prompt (ON=1 OFF=0 1) will appear, illustrated in Para. 10.02.
5. For AM1 PLUS-1 (Analog Loop/Ground Start) and AM1 PLUS-2 (E&M) Basic Units, the green "PROG" LED will light above Line Card 1. This indicates that the Line Parameters for Line 01 are being PROGrammed or reviewed.

Repeatedly press [ETR/STP PARAM,B] and step through the Line Parameter prompts illustrated in Para. 10.02 thru Para. 10.29 (also listed in Fig. 4-3). Not all the prompts shown will appear. The prompts that are enclosed in a box will only appear for the condition noted at the top of the box; for example, the display in Para. 10.04 will only appear if there is a T1 unit in the set. After stepping through all the Line Parameter prompts, press [SEL LINE,A]; the Line Select prompt will appear, LINE 01.

Copying Parameters from One Line to Another. Once the required Line Parameters have been set for one line, it is often desired to set the same parameters for one or all of the other lines. This is accomplished with the COPY command, described in Para. 10.30.

4.11 GENERAL OPERATION NOTES AND TECHNIQUES, continued

EXAMPLE: Setting a Telephone Number

1. Press [SEL LINE,A].
2. Press [0] [7] [ETR/STP PARAM,B] to select Line Parameters for Line 07. Green "PROG" LED (on AM1 PLUS-1 or -2) will light above Line Card 7.
3. Press [ETR/STP PARAM,B] once more (3 more times for AM1 PLUS-D unit) until Dialed Number Field prompt appears (will be a blank field if no Telephone Number has been previously entered).
4. Enter the digits of your home phone number. For example, press [9] [1] [5] [5] [4] [4] [1] [ETR/STP PARAM,B] for Ameritec Corporation.
5. Press [SHIFT,D] [3, ETR ↑] to return to Dialed Number Field prompt and confirm that the Telephone Number is entered.
6. Repeatedly press [SHIFT,D] [0,BLANK] until the display is blank. Actually, the first blank in the field would prevent any outpulsing of digits.
7. Press [SEL LINE,A]; observe Line Select display, LINE 07.

Data Registers. The Data Register displays (test results) for each line follow the Line Parameter prompts.

Again repeatedly press [ETR/STP PARAM,B] and step through all the Line Parameter prompts illustrated in Para. 10.01 thru Para. 10.29 and then the Data Register displays illustrated in Para. 13.08 thru Para. 13.17 (also listed in Fig. 4-3).

If [ETR/STP PARAM,B] is pressed again after the last Data Register display, the next display to appear will be the first Line Parameter (ON=1 OFF=0 1) of the next line over. The green "PROG" LED will light above the next line card for Analog and E&M units.

Arrangement of Parameter Prompts and Data Registers. The Parameter prompts and Data Registers are shown in Fig. 4-3. SEE FOLDOUT AT END OF MANUAL FOR COPY OF FIG. 4-3. Note the following points:

A. Unit Parameter settings apply to all lines.
B. The Unit Parameter prompts are in Line 00.
C. The Unit Parameter prompts are illustrated and explained in Para. 9.01 thru Para. 9.14.
D. There are 30 sets of Line Parameter prompts, Line 01 thru Line 30, although only one (1) set is listed in Fig. 4-3.
E. The Line Parameter prompts are illustrated and explained in Para. 10.01 thru Para. 10.29. All the possible Line Parameter prompts are shown in Fig. 4-3; the prompts labeled with and asterisk (*) only appear for certain setups.
F. At the end of each set of Line Parameter prompts are the Data Register displays for that line.
G. The Data Register displays are illustrated and explained in Para. 13.07 thru Para. 13.17.
H. The Data Registers record the results of the call generation testing; these displays are for information only -- they are not prompts to enter user-selected values.

4.11 GENERAL OPERATION NOTES AND TECHNIQUES, continued

UNIT PARAMETER PROMPTS/DISPLAYS	LINE PARAMETER PROMPTS AND DATA REGISTER DISPLAYS
LINE 00	LINE 01 ..... thru ..... LINE 30

LINE 00	LINE 01 ..... thru ..... LINE 30	
CLOC 0000-010100	ON=1 OFF=0 1	
MODE AC=1 AS=2 1	ORIG PORT A-01*	
SYN=1 RAN=2 2	TERM PORT A-01*	
AUTO PRT NO=0 1		"TELEPHONE NUMBER"
RT ERR YES=1 0	DT DELAY 03	
ST 1 0000-010100	DT FAIL 15	
FI 1 0000-010100	PR=1 UNPR=2 1	
ST 2 0000-010100	CONF TONE 12*	
FI 2 0000-010100	O-T TONE O-D*	
- TIME 03	SUP CH 1=N 2=Y 1	
CT TIME 02	1 D-W 00000-0000*	
PWR RCL TEL 1	2 D-W 00000-0000*	LINE PARAMETERS Para. 10.01 thru Para. 10.29
PWR RCL PARAM 0	TIMEOUT-RNG 10-1	
LAST RCL TEL 3	INTERCALL 03	
LAST RCL PARAM 2	CALL-CALL 0000	
BAUD 0300	TT=1 DP=2 MF=3 4	
PARITY ODD=1 0	LO FRE _00*	All possible Line Parameters are shown. Line Parameters with an asterisk (*) only appear for certain setups.
VERSION 16	HI FRE _00*	
	LO HI DB :06:06*	
Para. 9.01 thru Para. 9.16	ON-OFF TIM 60-60*	
	SPEED-BR 10-60*	
	ID-DELAY 0600*	
	CONV TIME 0000	
	START DELAY 000	
	FLASH TIME 0500	
	CONFIRM TRIES 1*	
	ATTEMPTS _00000	DATA REGISTERS Para. 13.07 thru Para. 13.17
	AVG DT _000.0	
	DT DELAYS _00000	
	NO DT _00000	
	NO RING _00000	
	NO TONE _00000	
	AVG PD _000.0	
	COMPLETE _00000	
	RUN TIME _00000	
	TERM ONS 00000	

Step to same display on next line over →

↑ Go to top of scroll

↓ Step to next display in scroll

Step to previous display in scroll ↑

Figure 4-3. Display Array: Parameter Prompts and Data Registers

NOTE

FOLDOUT OF THIS FIGURE IS AT THE END OF THE MANUAL.

4.11 GENERAL OPERATION NOTES AND TECHNIQUES, continued

Stepping to Desired Parameter Prompt or Data Register.

Refer to Fig. 4-3. To go to the desired display, use the appropriate technique listed below:

A. To select the desired line,
   1. Press [SEL LINE,A]
   2. Enter the number of the desired line
   3. Press [ETR/STP PARAM,B]

   NOTE
   For Analog and E&M units, the green "PROG" LED will light above the Line Card of the line selected.

B. To go to desired prompt, step forward to it by repeatedly pressing [ETR/STP PARAM,B].

C. To scroll backward through the displays, repeatedly press [SHIFT,D] [3, ETR ↑].

D. To go to the top of the scroll, press [SEL LINE,A].

E. To step to the same display on the next line, press [ETR/STP LINE,C]. For Analog and E&M units, the green "PROG" LED will go out on the first line and light on the next line, indicating that the new line in now accessed. For example, to enter Telephone Numbers for all the lines,
   1. Enter the desired number in the Dialed Number Field (Para. 10.06) for Line 01.
   2. Press [ETR/STP LINE,C] to enter the Telephone Number and step to the Dialed Number Field of Line 02.
   3. Repeat Steps 1 and 2 for the remaining lines.

Common Operator Errors. Two (2) very common operator errors are described below:

A. REMEMBER to press [SHIFT,D] first before pressing a key to access a secondary function; see Fig. 4-2. Forgetting to press [SHIFT,D] -- the PINK key! -- is probably the most common error in AM1 PLUS operation.

B. Another common error is to forget to press
   1. [ETR/STP PARAM,B]
   2. [ETR/STP PARAM,C] or
   3. [SHIFT,D] [3, ETR ↑]

   to enter a new parameter value into RAM memory. After entering a new value into the display,
   1. Do not press [SEL LINE,A].
   2. Do not just leave a display alone.

   First, use one of the three (3) ways listed above to enter the new value.

4.11 GENERAL OPERATION NOTES AND TECHNIQUES, continued

Correcting Mistakes. There are two (2) types of mistakes, listed below along with the method(s) used to correct the mistake:

A. [ETR/STP PARAM,B] is pressed with an unacceptable value in the display, and the display FLASHES, indicating that the value was not entered. To enter a correct value:
   1. Check the acceptable range of values given for the prompt.
   2. Enter an acceptable value. The display will stop flashing with the entry of the first character into the display.
   3. Press [ETR/STP PARAM,B] to enter the new value.

B. An undesired value is entered into the display by mistake and the user wants to change the value. The mistake can be corrected using one of two (2) methods:

METHOD 1

   1. Press [SHIFT,D] [3,ETR ↑] to go to the previous prompt.
   2. Press [ETR/STP PARAM,B] to return to the original prompt.
   3. Enter the desired value (write over the undesired value).
   4. Press [ETR/STP PARAM,B] to enter the new value and step to the next prompt.

METHOD 2

   1. Press [SEL LINE,A] to return to the first prompt for the selected line (LINE 00 for Unit Parameters).
   2. Repeatedly press [ETR/STP PARAM,B] as necessary to step to the original prompt.
   3. Enter the desired value.
   4. Press [ETR/STP PARAM,B] to enter the new value and step to the next prompt.

5. AM1 PLUS-1, ANALOG BASIC UNIT

5.01 INTRODUCTION

This section describes physical and functional features that are distinct to the AM1 PLUS-1 Analog Basic Unit. See Section 4 for features that are common to all Basic Units. The paragraphs in this section are listed below:

5.02 General
5.03 Front Panel Components
5.04 Front Panel Line Card Labeling
5.05 Line Card Tone Generation/Detection Circuitry
5.06 Line Interface (Telephone Port Connections)
5.07 Line Cables
5.08 Line Cable Panel-Mount Adaptor

5.02 GENERAL

The AM1 PLUS-1 has 10 identical Line Cards which are installed behind the front panel. Under normal operation, the cards are used with the components that are accessed through openings in the front panel. However, if a Line Card is replaced (by removing the front panel), it is necessary to set address DIP switches on the new Line Card; see Appendix D.

The AM1 PLUS-1 has connections for 10 dual-port Lines:

A. 10 loop or ground start Originate Ports and
B. 10 loop Terminate Ports.

The AM1 PLUS-1 can control a Set of 30 dual-port lines (30 Originate Ports and 30 Terminate Ports) with many possible combinations of loop/ground start, E&M and T1 ports. The additional 20 lines are connected using an Expansion Unit and/or a T1 Adaptor; see Section 12 for possible connections and configurations.

5.03 FRONT PANEL COMPONENTS (Fig. 5-1)

Component Location. The Front Panel of an AM1 PLUS-1 Basic Unit is illustrated in Fig. 5-1. A detailed view is shown of the Line Card components that come out to the Front Panel; these components are the same for each of the (10) Line Cards. The numbering of the descriptions below corresponds to the numbering of the components in Fig. 5-1. See Fig. 4-1 for descriptions of the other Front Panel components.

(1) Digital Adaptor Connector. 37-pin D-type, female. AM1T1 Adaptor can be connected here to add T1 lines to the set. Mating cable is supplied with each AM1T1 Unit; see Fig. 8-8.

(2) BUSY LED, Red. This will light when Originate Port comes off-hook and will stay ON until Originate Port goes back on-hook.

(3) Display (PROG) LED, Green. Lights when this line is selected (see Para. 4.11 under "Line Select Prompt"). When "PROG" LED is lit, Line Parameters for this line are being PROGrammed or reviewed on the Display. This LED flashes when this line is stopped when operating in Auto Stop-on-Trouble Mode (Para. 9.03). Also, this LED indicates "selected" line for printout purposes; see Para. 14.09,A.

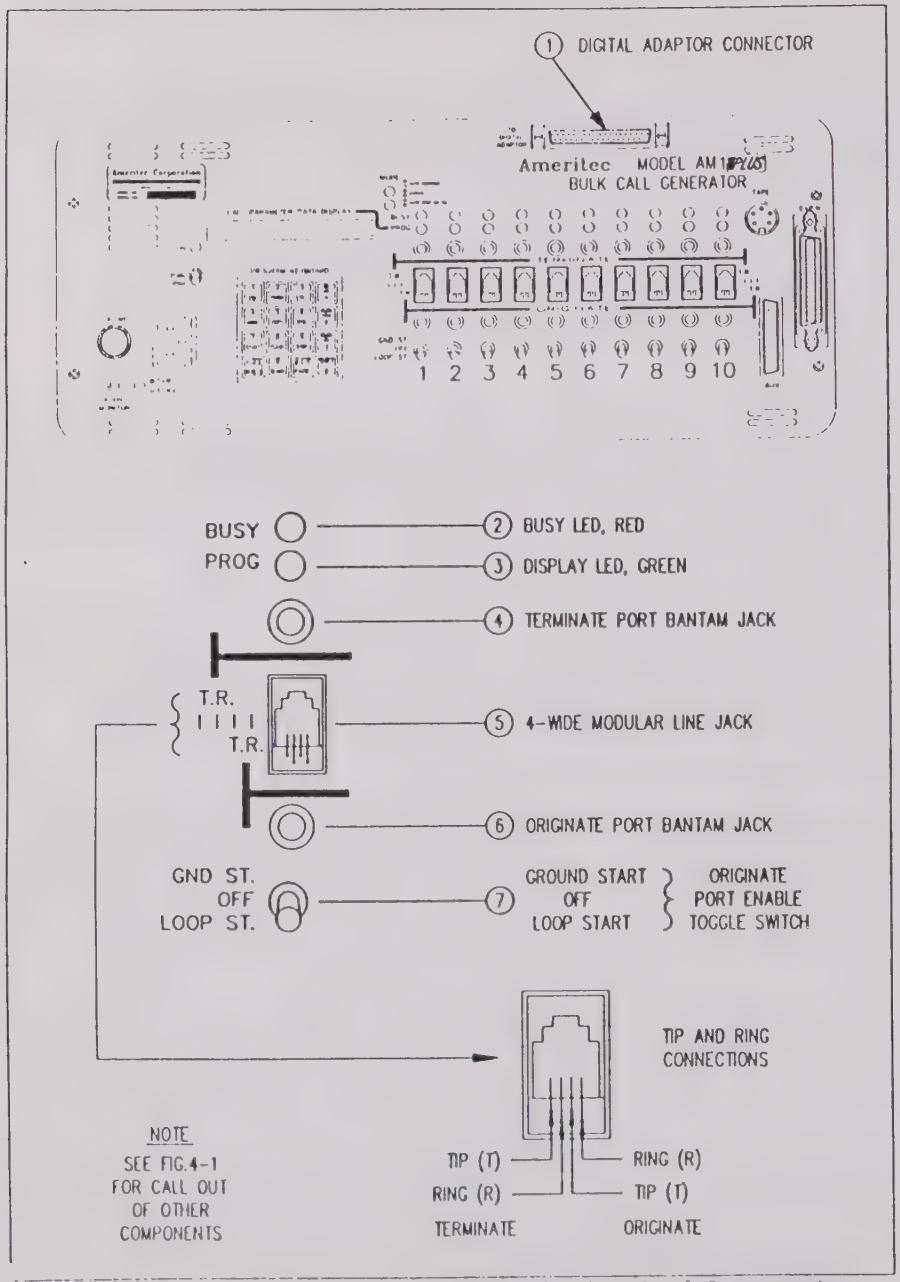


Figure 5-1. AM1 PLUS-1 Front Panel with Line Card Components

5.03 FRONT PANEL COMPONENTS (Fig. 5-1), continued

④ TERMINATE Port Bantam Jack. Located above the Modular Jack, this provides access to the Terminate Port Tip and Ring connections. This jack is especially useful to audibly monitor activity at the Terminate Port of the line. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the Terminate Port; see Para. 13.05 under "Audio Monitor".

⑤ 4-Wide Modular Line Jack (Female). The Tip and Ring connections of the four (4) contacts are labelled in the detail view of this connector in Fig. 5-1. One pair of connections is for the Originate Port and the other pair is for the Terminate Port. See Para. 5.07 for the different cables available to connect to this Modular Jack. Note that this is not an RJ11 (6-wide) Modular Jack, normally used to connect a telephone line; it is a narrow (4-wide) Modular Jack typically used to connect a telephone handset.

⑥ ORIGINATE Port Bantam Jack. Located below the Modular Jack, this provides access to the Originate Port Tip and Ring connections. This jack is especially useful to audibly monitor activity at the Originate Port of the line. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the Originate Port; see Para. 13.05 under "Audio Monitor".

⑦ Originate Port Enable Toggle Switch (GND ST/OFF/LOOP ST). This is a 3-position switch. To enable the Originate Port, set the switch:

A. Up for a Ground Start (GND ST) line or
B. Down for a Loop Start (LOOP ST) line.

With this switch in one of the enabled positions, a START command (Para. 13.03) will cause the Originate Port of the line to come off-hook and start the Call Sequence (Table 13-1).

With this switch in the middle (OFF) position, this Originate Port will not come off-hook when a START command is used to start the unit running (generating calls).

NOTE

This switch only affects the Originate Port. Programmed Terminate Ports will respond when the AM1 PLUS-1 is running or in the FINISH mode, regardless of the position of this switch.

Rubber Boot. This switch is covered with a rubber "boot". The color of the rubber identifies the AM1 PLUS-1 loop resistance:

BLACK = standard 1200 Ohms of loop resistance per port
BLUE = 600 Ohms of loop resistance per port (optional)

Remote ON/OFF Control. If this switch is left in one of the enable positions, it can be turned ON and OFF using the Line Enable prompt (Para. 10.02). This is a useful feature for remote control through the RS232 port (Para. 14.14).

5.04 FRONT PANEL LINE CARD LABELING

Port Connections Identification Lines. There are four (4) line segments, labelled "T.R. T.R.", located on the Front Panel both to the left and to the right of the array of 10 Modular Jacks. The left sets of "T.R." are joined with a heavy black line above the Modular Jacks, labeled TERMINATE and the right sets of "T.R." are joined with a heavy black line below the Modular Jacks, labeled ORIGINATE. This labeling indicates that:

A. The left set of connections in the Modular Jack are the Terminate Port Tip and Ring and are in parallel with the TERMINATE line Bantam Jack.
B. The right set of connections in the Modular Jack are the Originate Port Tip and Ring and are in parallel with the ORIGINATE line Bantam Jack.

Line Numbers. The line numbers, 1 thru 10, are labeled below the Originate Port Enable Toggle Switches. Numbering is continued on Expansion Units, from 11 thru 30.

5.05 LINE CARD TONE GENERATION/DETECTION CIRCUITRY

Individual Tone Generators. Each Line Card in the AM1 PLUS-1 has its own DTMF (Touch Tone) Generator. This is in addition to the shared Tone Generator in the common circuitry. Dialing Mode "4" (TT) uses the individual Line Card Tone Generators. Dialing Modes "1" (TT) and "3" (MF) use the common Tone Generator. Dialing Mode "4" is capable of much larger Call Volume compared to Dialing Mode "1". See Para. 10.06 for complete discussion.

Individual Tone Detectors. Each Line Card in the AM1 PLUS-1 has its own Tone Detector to detect Dial Tone, Line Busy and Reorder tones.

Shared Confirmation Tone Circuitry. The Confirmation Tone Generator and Confirmation Tone Detector are shared between all lines.

5.06 LINE INTERFACE (TELEPHONE PORT CONNECTIONS)

Telephone Set Simulation. The AM1 PLUS-1 has 10 dual port interfaces, a total of 10 Originate Ports and 10 Terminate Ports. Each Originate Port and each Terminate Port simulates a conventional telephone set. Connect the AM1 PLUS-1 to the switch or machine under test as though there were a telephone set connected at each port. For Paired Operation, the call generated from the Originate Port of each Line Card must terminate at the Terminate Port of the same Line Card.

Loop Resistance. The usual loop resistance per port is 1200 Ohms, used with a 48 Vdc line. Optionally, the loop resistance of the AM1 PLUS-1 Line Cards can be factory-set for 600 Ohms; this is normally done when the AM1 PLUS-1 is to be used with 24 Vdc PBXs where the loop limits are typically 800 to 1000 Ohms maximum.

5.06 LINE INTERFACE (TELEPHONE PORT CONNECTIONS), continued

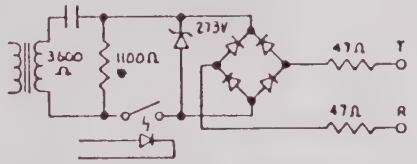
The Originate Port Enable Toggle Switch is covered with a rubber boot. The color of the rubber boot identifies the loop resistance at each port of the AM1 PLUS-1:

BLACK (standard) = 1200 Ohms of loop resistance per port (48 Vdc lines)

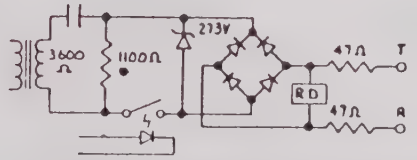
BLUE (optional) = 600 Ohms of loop resistance per port (24 Vdc lines)

The total loop resistance (the sum of external loop resistance plus the 1200 or 600 Ohms of the AM1 PLUS-1) should not exceed the rated maximum loop resistance for the switch. Too much loop resistance could result in failure to seize the loop, detect Dial Tone, or detect Confirmation Tone.

Polarity-Insensitive Line Interface Circuitry. The AM1 PLUS-1 line circuits each contain a diode bridge, making it possible to connect the Tip and Ring without concern for polarity. The schematic diagrams of the Originate Port and Terminate Port are shown in Fig. 5-2.



ORIGINATE PORT CIRCUITRY
(Loop Start)



R.D. = Ring Detector

TERMINATE PORT CIRCUITRY

* 500 Ohms when equipped with optional 600-Ohm loop resistance.

Figure 5-2. Originate Port and Terminate Port: Schematic Diagrams

Modular Jacks. The AM1 PLUS-1 has 10 Line Cards. Each Line Card has a dual-port interface -- an Originate Port Tip and Ring pair of connections and a Terminate Port Tip and Ring pair of connections. The contacts to the dual-port interface are made through a 4-wide Modular Jack. See Para. 5.03,5 for a description of the Modular Jack; the assignments of the contacts are shown in Fig. 5-1. The cables available to connect to the Modular Jacks are described next, in Para. 5.07.

5.07 LINE CABLES

There are four (4) types of Line Cables available to connect to the Modular Line Jacks. Select between far-end connections of spade lugs (for screw terminals), minigator clips, .045 sleeves (hollow tubes which slide over wire- wrap pins) or two (2) RJ-11 plugs (to connect to 2 RJ-11 phone jacks). The Line Cables are illustrated in Fig. 5-3, together with lengths and Model Numbers.

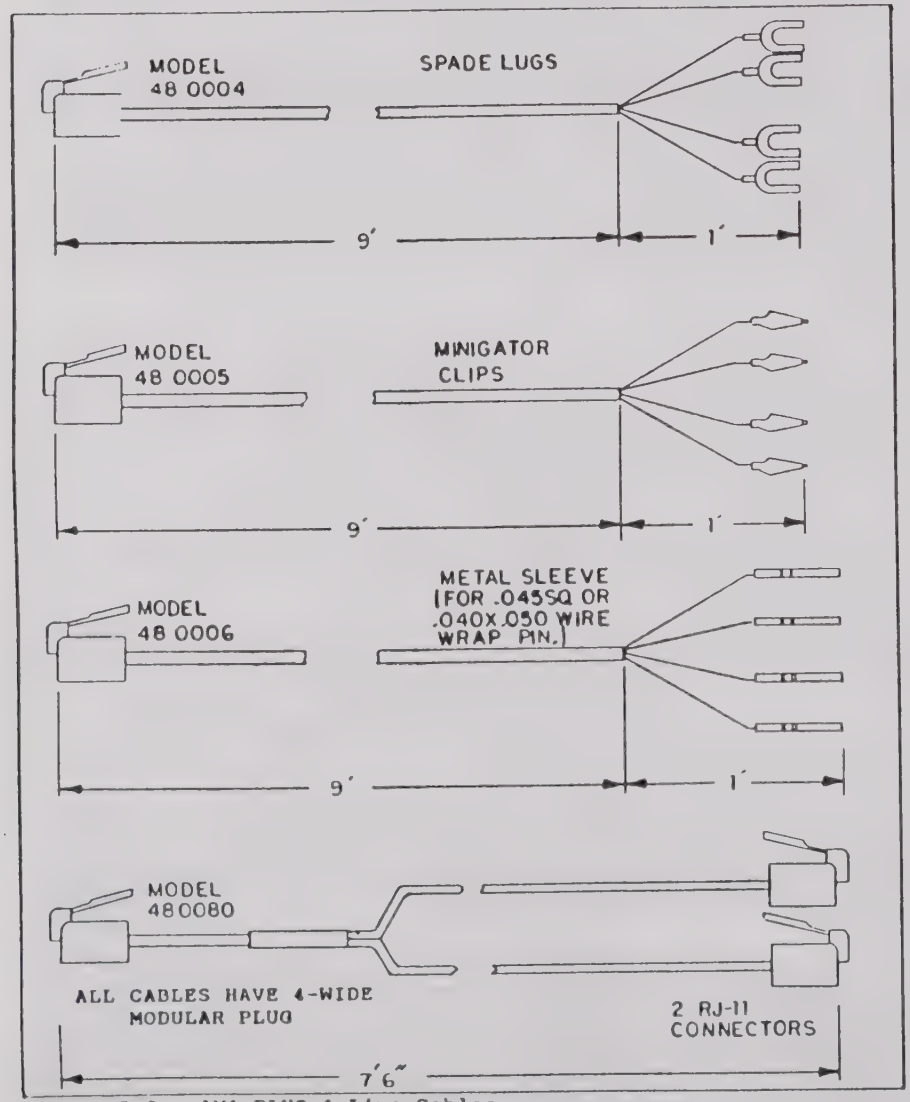


Figure 5-3. AM1 PLUS-1 Line Cables

5.07 LINE CABLES, continued

Wire color-coding for cables 48-0004, 48-0005, and 48-0006 is listed in Table 5-1.

Table 5-1
Wire Color-Coding for Line Cables

WIRE COLOR		CONNECTION
Red	Tip (T)	Originate Port
Black	Ring (R)	
Yellow	Tip (T)	Terminate Port
Green	Ring (R)	

5.08 LINE CABLE PANEL-MOUNT ADAPTOR

Another way to make connection to the lines is to use an optional Panel-Mount Adaptor (Model 48-0018). This Adaptor is mounted on the Front Panel at the factory. It has 10 Modular Plugs which are connected to the Modular Jacks on the Line Cards. The connections of the 10 dual ports are brought down to a single 25-pair (50-pin) female Amphenol Connector.

Figure 5-4 shows the 48-0018 Adaptor mounted on the Front Panel of an AM1 PLUS-1. This allows convenient connect/disconnect of all contacts with mating 25-pair male Amphenol Connector; Fig. 5-5 illustrates three (3) possible mating cables. The pin assignments for the 48-0018 are listed in Table 5-2.

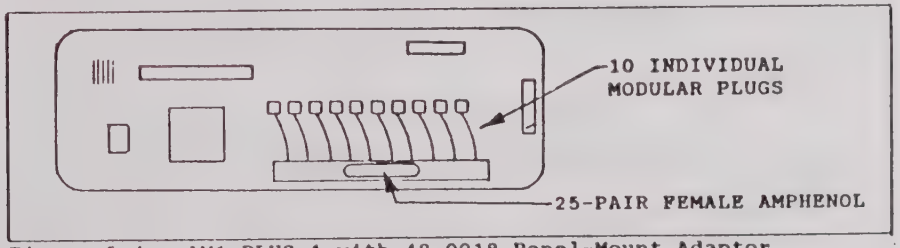


Figure 5-4. AM1 PLUS-1 with 48-0018 Panel-Mount Adaptor

Table 5-2
Pin Assignments for Panel-Mount Adaptor (48-0018)

25-Pair Amphenol, Female PIN NUMBERS	CONNECTIONS
1 & 26	T & R Originate Line #1
2 & 27	T & R Terminate Line #1
3 & 28	T & R Originate Line #2
4 & 29	T & R Terminate Line #2
5 & 30	T & R Originate Line #3
6 & 31	T & R Terminate Line #3

(continued on next page)

5.08 LINE CABLE PANEL-MOUNT ADAPTOR, continued

Table 5-2, continued
Pin Assignments for Panel-Mount Adaptor (48-0018)

25-Pair Amphenol, Female PIN NUMBERS	CONNECTIONS
7 & 32	T & R Originate Line #4
8 & 33	T & R Terminate Line #4
9 & 34	T & R Originate Line #5
10 & 35	T & R Terminate Line #5
11 & 36	T & R Originate Line #6
12 & 37	T & R Terminate Line #6
13 & 38	T & R Originate Line #7
14 & 39	T & R Terminate Line #7
15 & 40	T & R Originate Line #8
16 & 41	T & R Terminate Line #8
17 & 42	T & R Originate Line #9
18 & 43	T & R Terminate Line #9
19 & 44	T & R Originate Line #10
20 & 45	T & R Terminate Line #10
21 & 46	No Connection
22 & 47	No Connection
23 & 48	No Connection
24 & 49	No Connection
25 & 50	No Connection

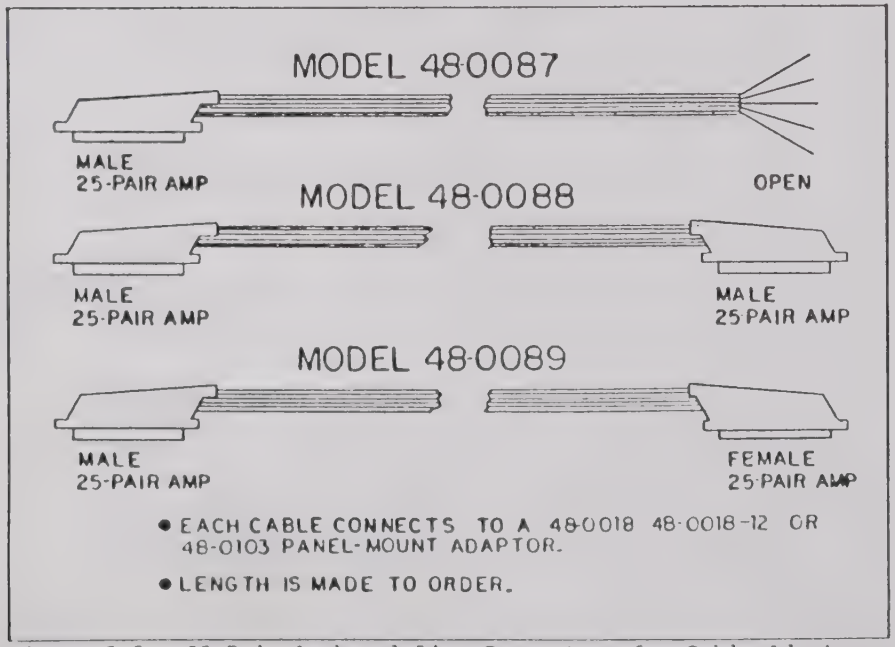


Figure 5-5. 25-Pair Amphenol Line Connectors for Cable Adaptors

6. AM1 PLUS-2, E&M BASIC UNIT

6.01 INTRODUCTION

This section describes physical and functional features that are distinct to the AM1 PLUS-2 E&M Basic Unit. See Section 4 for features that are common to all Basic Units.

The paragraphs in this section are listed below:

6.02 General
6.03 Front Panel Components
6.04 Send/Receive Gain Offset
6.05 Call Initiation Method
6.06 Line Connections: Signaling Circuit Interface
6.07 Line Cables
6.08 Line Cable Rack-Mount Panel Adaptor

6.02 GENERAL

The AM1 PLUS-2 has 10 identical Line Cards which are installed behind the front panel. Under normal operation, the cards are used with the components that are accessed through openings in the front panel. However, if a Line Card is replaced (by removing the front panel), it is necessary to set address DIP switches on the new Line Card; see Appendix D.

The AM1 PLUS-2 has connections for 10 dual-port lines:

A. 10 2-Wire or 4-Wire E&M Originate Ports and
B. 10 2-Wire or 4-Wire E&M Terminate Ports.

AM1 PLUS-2 ports emulate Transmission Equipment (T.E.) only, loading the local switch. Expansion Units, Models AM1E PLUS-3, AM1EXT-3, and AM1EXT-2, can emulate either Transmission Equipment (T.E.) or Switching Equipment (SW); see Para. 8.04,A,9 and Table 8-1. See Para. 15.04 concerning E&M signaling.

The AM1 PLUS-2 can control a Set of 30 dual-port lines (30 Originate Ports and 30 Terminate Ports) with many possible combinations of E&M, loop start, and T1 ports. The additional 20 lines are connected using an Expansion Unit and/or a T1 Adaptor; see Section 12 for possible connections and configurations.

NOTES

-When an AM1E PLUS-1, AM1E PLUS-3, AM1EXT-1 or AM1EXT-3 Expansion Unit is connected to the AM1 PLUS-2, use the Loop/Ground Start Analog ports in Loop Start only. Ground Start operation cannot be used with the E&M Basic Unit.
-There is no Dialing Mode "4" associated with E&M ports (see Para. 10.19), even though a "4" can be entered. If Dialing Mode "4" is chosen with an E&M port, digits will be outpulsed per Dialing Mode "1" (TT).

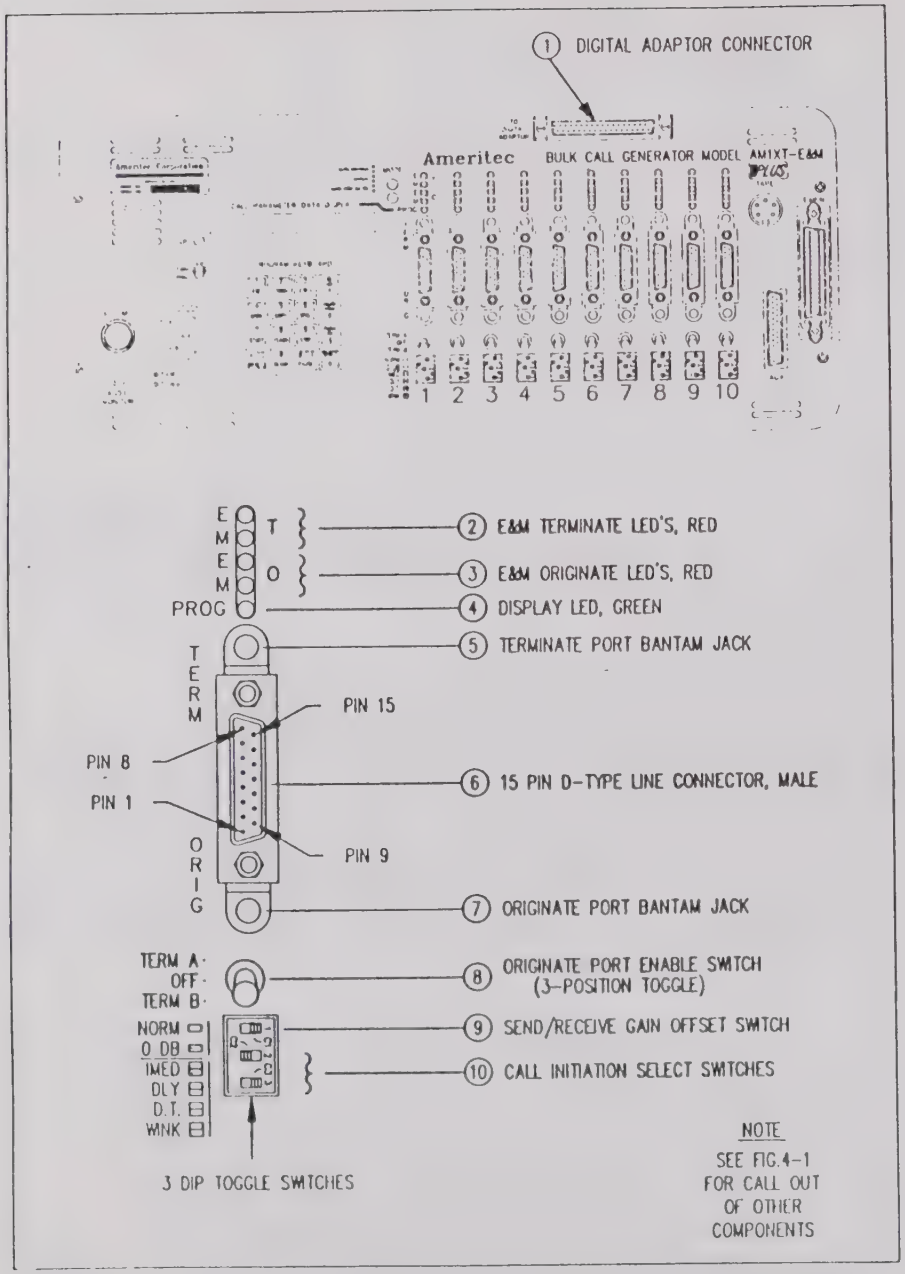


Figure 6-1. AM1 PLUS-2 Front Panel with Line Card Components

6.03 FRONT PANEL COMPONENTS (Fig. 6-1)

Component Location. The Front Panel of an AM1 PLUS-2 Basic Unit is illustrated in Fig. 6-1. A detailed view is shown of the Line Card components that come out to the Front Panel; these components are the same for each of the (10) Line Cards. The numbering of the descriptions below corresponds to the numbering of the components in Fig. 6-1. See Fig. 4-1 for descriptions of the other Front Panel components.

(1) Digital Adaptor Connector. 37-pin D-type, female. AM1T1 Adaptor can be connected here to add T1 lines to the Set. Mating cable is supplied with each AM1T1 Unit; see Fig. 8-8.

(2) E&M Terminate LEDs, Red. These light when current is flowing in the respective lead.

(3) E&M Originate LEDs, Red. These light when current is flowing in the respective lead. The "E" LED lights when the Originate Port is off-hook; it will blink during dialing. The "M" LED lights momentarily when the Wink (start signal) arrives and is on continuously if "M" lead answer supervision is returned.

(4) Display (PROG) LED, Green. Will light when this line has been selected (see Para. 4.11 under "Line Select Prompt"). When "PROG" LED is lit, Line Parameters for this line are being PROGrammed or reviewed on the Display. This LED flashes when this line is stopped when operating in Auto Stop-on-Trouble Mode (Para. 9.03). Also, this LED indicates "selected" line for printout purposes; see Para. 14.09,A.

(5) TERMinate Port Bantam Jack. Located above the D-type Connector, this provides access to the Terminate Port Tip and Ring connections. This jack is especially useful to audibly monitor activity at the Terminate Port of the line. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the Terminate Port; see Para. 13.05 under "Audio Monitor". In the case of 4-Wire, both T/R (send pair) and T1/R1 (receive pair) are monitored simultaneously; the T/R and T1/R1 audio is superimposed.

(6) 15-Pin D-Type Line Connector, Male. Outside pin locations (1, 8, 9, 15) are given in Fig. 6-1. The pin assignments for this connector are listed in Table 6-2; also given are the wire colors in the cable of the mating connector. See Para. 6.07 and Fig. 6-5 for descriptions of the different cables available that plug into this connector.

(7) ORIGinate Port Bantam Jack. Located below the D-type Connector, this provides access to the Originate Port Tip and Ring connections. This jack is especially useful to audibly monitor activity at the Originate Port of the line. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the Originate Port; see Para. 13.05 under "Audio Monitor". In the case of 4-Wire, both T/R (send pair) and T1/R1 (receive pair) are monitored simultaneously; the T/R and T1/R1 audio is superimposed.

6.03 FRONT PANEL COMPONENTS (Fig. 6-1), continued

⑧ Originate Port Enable Switch (TERM A/OFF/TERM B). This is a 3-position switch. To enable the Originate Port, set the switch up or down to either TERM A or TERM B position.

NOTE

In some previous AM1 models, the labels "TERM A" and "TERM B" had meaning. TERM A position gave a 3-second delay at the Terminate port, to allow typical time for MF outpulsing; and TERM B position gave a 10-second delay, typical time for Dial Pulse. In the AM1PLUS, however, Terminate Port Delays are programmed with the Terminate Port Delay/Wink Timing prompt, described in Para. 10.15.

For the AM1 PLUS, TERM A or TERM B = ON (Originate Port Enabled).

With this switch in one of the enabled positions, a START command (Para. 13.03) will apply ground to the E lead of the Originate Port (Table 6-1), starting the Call Sequence (Table 13-1).

With this switch in the middle (OFF) position, this Originate Port E lead will not be grounded when a START command is used to start the unit running (generating calls).

NOTE

This switch only affects the Originate Port. Programmed Terminate Ports will respond when the AM1 PLUS-2 is running or in the FINISH mode, regardless of the position of this switch.

Remote ON/OFF Control. If this switch is left in one of the enable positions, it can be turned ON and OFF using the Line Enable prompt (Para. 10.02). This is a useful feature for remote control through the RS232 port.

⑨ ⑩ DIP Toggle Switches -- three (3) Toggle Switches, mounted in a Dual In-line Package (DIP). These switches perform two (2) functions as described in Para. 6.04 and Para. 6.05.

6.04 SEND/RECEIVE GAIN OFFSET (Fig. 6-2)

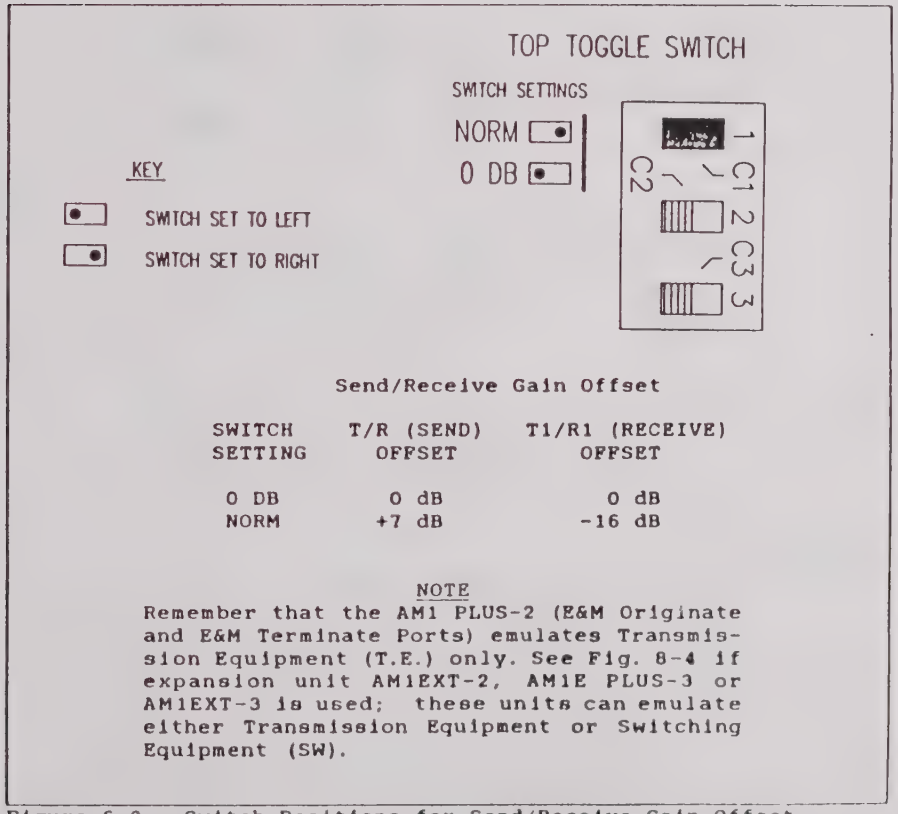
The Top switch (item 9 in Fig. 6-1) of the DIP Toggle Switches controls the Offset of the Send/Receive Gain on a per-line basis. Each dual-port line can be individually configured with or without the offsets. Figure 6-2 shows the switch positions and lists the associated offsets. The offsets for the NORMal position simulate the carrier Transmission Level Points (TLP) that are commonly found at the output of Transmission Equipment in the telephone network.

6.04 SEND/RECEIVE GAIN OFFSET, continued

Send Gain Offset. The Tone Dialing Output Level prompt, Para. 10.22, sets the Low and High Band levels for Tone Dialing. The NORM switch position will offset the Low and High Band levels by +7 dB. With a 0 DB switch position, the Low and High Band levels will remain as set by the prompt of Para. 10.22.

EXAMPLE: Low/High Band levels are set for -06/-06 per prompt in Para. 10.22. Gain Offset Switch is in NORM position. From Fig. 6-2, the Low/High Send levels will be offset by +7 dB.

Therefore, Low/High Band Tones will be outpulsed at:
-6 +7/-6 +7 = +1/+1 dBm.
The Receive Gain will be offset by -16 dB.



Send/Receive Gain Offset

SWITCH SETTING	T/R (SEND) OFFSET	T1/R1 (RECEIVE) OFFSET
0 DB	0 dB	0 dB
NORM	+7 dB	-16 dB

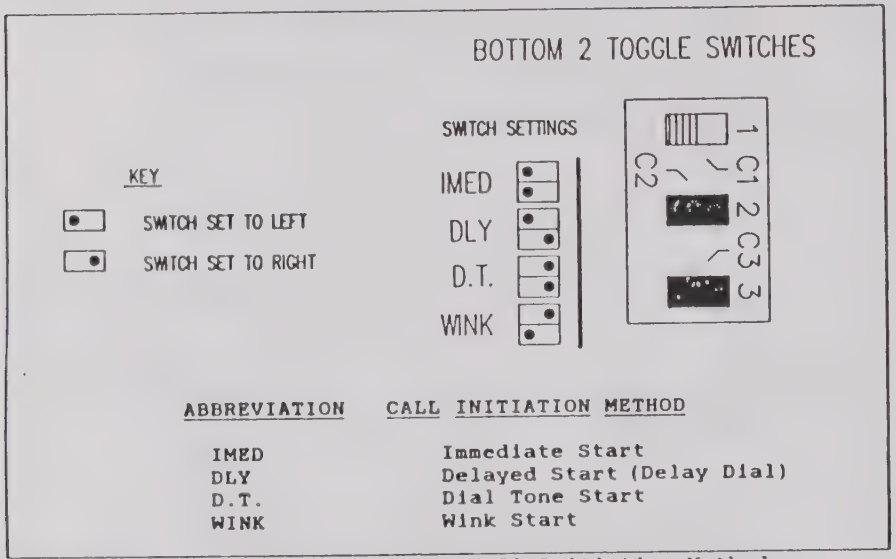
NOTE

Remember that the AM1 PLUS-2 (E&M Originate and E&M Terminate Ports) emulates Transmission Equipment (T.E.) only. See Fig. 8-4 if expansion unit AM1EXT-2, AM1E PLUS-3 or AM1EXT-3 is used; these units can emulate either Transmission Equipment or Switching Equipment (SW).

Figure 6-2. Switch Positions for Send/Receive Gain Offset

6.05 CALL INITIATION METHOD (Fig. 6-3)

The Bottom two (2) switches (item 10 in Fig. 6-1) of the DIP Toggle Switches are used to select one of four (4) possible methods of Call Initiation on a per-line basis. Each dual-port line can be individually configured for Call Initiation type. Figure 6-3 shows the switch positions to select the desired method of Call Initiation. The events that occur for each method of Call Initiation are described in Table 6-1.



ABBREVIATION	CALL INITIATION METHOD
IMED	Immediate Start
DLY	Delayed Start (Delay Dial)
D.T.	Dial Tone Start
WINK	Wink Start

Figure 6-3. Switch Positions for Call Initiation Method

Table 6-1
Events for Each Call Initiation Method
(See Table 6-2 for Connector Pin Assignments)

CALL INITIATION	EVENTS
Immediate Start	Ground applied to Originate "E" (pin 4). Dialing follows 500 ms later.
Delayed Start (Delay Dial)	Ground applied to Originate "E" (pin 4). Dialing follows after Originate "M" (pin 11) goes to ground.
Dial Tone Start	Ground applied to Originate "E" (pin 4). Dialing follows after Dial Tone is sensed on Originate T1 and R1 (pins 2 and 9) for 4-wire or on Originate T and R (pins 3 and 10) for 2-wire.
Wink Start	Ground applied to Originate "E" (pin 4). Dialing follows after Originate "M" (pin 11) winks to -48 Vdc and back to ground.

6.06 LINE CONNECTIONS: SIGNALING CIRCUIT INTERFACE

Line Numbers. The line numbers, 1 thru 10, are labeled below the DIP Toggle Switches. Numbering is continued on Expansion Units, from 11 thru 30.

The AM1 PLUS-2 emulates Transmission Equipment (T.E.). See Fig. 15-1 for block diagrams of E&M interfaces between switching and transmission equipment. The AM1 PLUS-2 is equivalent to the Signaling Circuit which directs calls to the Trunk Interface of a Switch.

Figure 15-4 shows the transmission equipment E&M interface circuitry in an AM1 PLUS-2. Note that the AM1 PLUS-2 does not contain the circuitry shown in Fig. 15-5, which emulates switching equipment.

Figure 6-4 depicts the reflected impedance (600 ohms) for both the Transmit (T, R) and Receive (T1, R1) legs of each E&M line card. Note that the reflected impedance varies as the square of the turns ratio. With a 3:1 turns ratio, the impedance ratio is 9:1 or 5400:600.

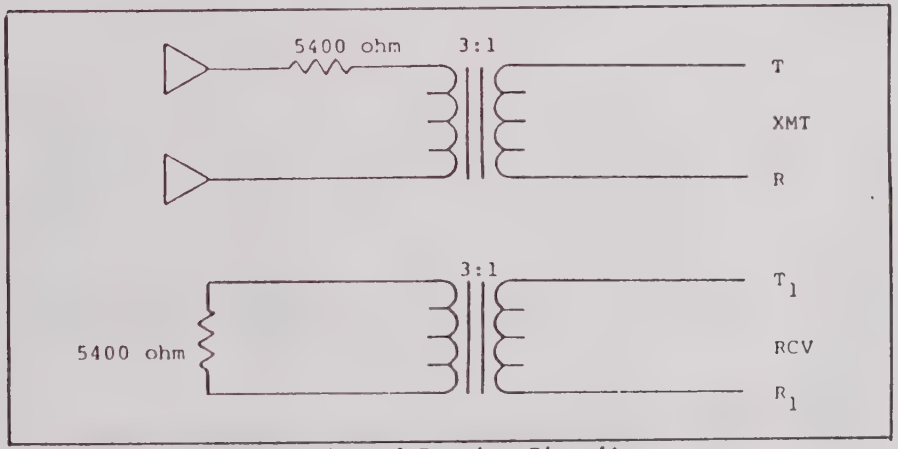


Figure 6-4. E&M Transmit and Receive Circuits

The AM1 PLUS-2 can be configured for either 2-wire E&M or 4-wire E&M:

-For 2-wire E&M, use T, R, E and M contacts.
-For 4-wire E&M, use T, R, T1, R1, E and M contacts.

6.07 LINE CABLES (Fig. 6-5, Table 6-2)

There are three (3) types of Line Cables available to connect to the D-type Line Connectors. Each Line Cable is 10 feet long and has 13 wires. Select between far-end connections of open (plain wires), minigator clips, or .045 sleeves (hollow tubes which slide over wire-wrap pins). The Line Cables are illustrated in Fig. 6-5, together with Model Numbers. Pin assignments and wire color-coding are listed in Table 6-2.

6.07 LINE CABLES (Fig. 6-5, Table 6-2), continued

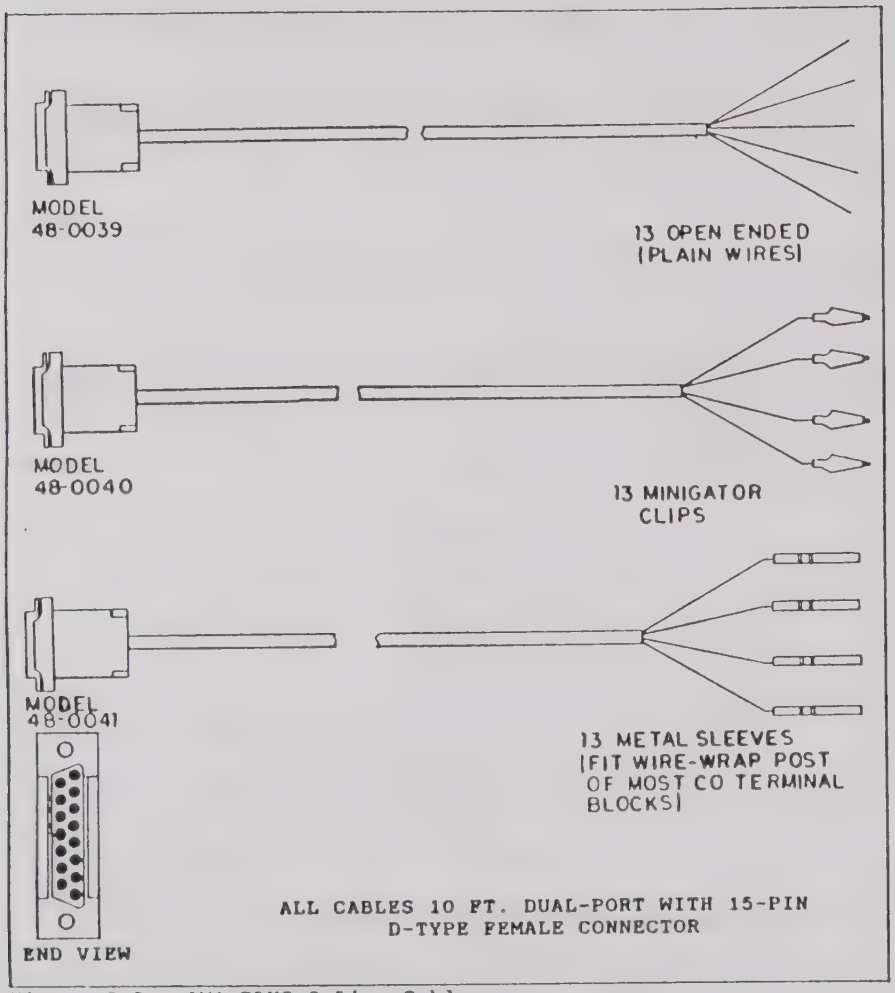


Figure 6-5. AM1 PLUS-2 Line Cables

Wire color-coding and pin assignments for Cables 48-0039, 48-0040, and 48-0041 (Fig. 6-5) are listed in Table 6-2.

NOTES

-The Ground wire (Pin 1, Brown) of at least one dual port cable must be connected to Switch Ground.
-Pins 5 and 12 are not used.

6.07 LINE CABLES (Fig. 6-5, Table 6-2), continued

Table 6-2
Pin Assignments and Color-Coding for Line Cables
(15-Pin D-Type Connector, Female)

PIN	CABLE WIRE COLOR	CONNECTION
1	Brown	Ground
		ORIGINATE CONNECTIONS
3	Orange	Tip (T)
10	White	Ring (R)
2	Red	Tip 1 (T1)
9	Slate	Ring 1 (R1)
4	Yellow	E
11	Red/Black	M
		TERMINATE CONNECTIONS
7	Violet	Tip (T)
14	Red/Yellow	Ring (R)
8	Green	Tip 1 (T1)
15	Red/Green	Ring 1 (R1)
6	Blue	E
13	Tan	M

6.08 LINE CABLE RACK-MOUNT PANEL ADAPTOR (Fig. 6-6, Table 6-3)

Another way to make connection to the lines is to use an optional Rack-Mount Panel Adaptor (Model 36-0003). This panel mounts in a 19" relay rack below a rack-mounted AM1 PLUS-2. It occupies 3 1/2" of vertical rack space and has 10 individual D-type connectors which are plugged into the Line Card connectors. The dual-port connections of the Line Cards are brought down to two (2) 64-pin female Amphenol connectors.

Figure 6-6 shows the 36-0003 Adaptor. It allows convenient connect/disconnect of all contacts with mating 64-pin male Amphenol Connectors. The pin assignments for the 36-0003 are listed in Table 6-3.

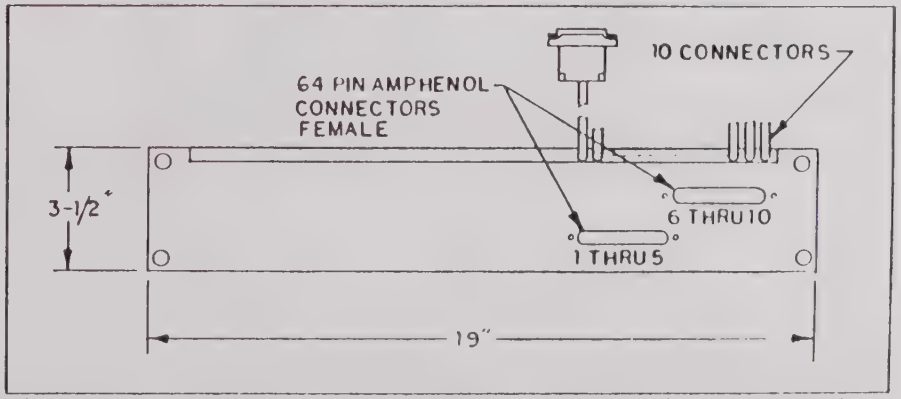


Figure 6-6. Rack-Mount Panel Adaptor (36-0003) for AM1 PLUS-2

6.08 LINE CABLE RACK-MOUNT PANEL ADAPTOR (Fig. 6-6, Table 6-3), continued

Table 6-3
Pin Assignments for 36-0003 Rack-Mount Panel Adaptor
Two (2) 64-Pin Amphenol Connectors, Female

LINES FOR LEFT, LOWER AMPHENOL CONNECTOR								LINES FOR RIGHT, UPPER AMPHENOL CONNECTOR
		ORG	T	1	33	R	WHT	
	ORIG.	RED	T1	2	34	R1	GRY	
LINE 1		YEL	E	3	35	M	RED/BLK	LINE 6
		VIO	T	4	36	R	RED/YEL	
	TERM.	GRN	T1	5	37	R1	RED/GRN	
		BLU	E	6	38	M	TAN	
		ORG	T	7	39	R	WHT	
	ORIG.	RED	T1	8	40	R1	GRY	
LINE 2		YEL	E	9	41	M	RED/BLK	LINE 7
		VIO	T	10	42	R	RED/YEL	
	TERM.	GRN	T1	11	43	R1	RED/GRN	
		BLU	E	12	44	M	TAN	
		ORG	T	13	45	R	WHT	
	ORIG.	RED	T1	14	46	R1	GRY	
LINE 3		YEL	E	15	47	M	RED/BLK	LINE 8
		VIO	T	16	48	R	RED/YEL	
	TERM.	GRN	T1	17	49	R1	RED/GRN	
		BLU	E	18	50	M	TAN	
		ORG	T	19	51	R	WHT	
	ORIG.	RED	T1	20	52	R1	GRY	
LINE 4		YEL	E	21	53	M	RED/BLK	LINE 9
		VIO	T	22	54	R	RED/YEL	
	TERM.	GRN	T1	23	55	R1	RED/GRN	
		BLU	E	24	56	M	TAN	
		ORG	T	25	57	R	WHT	
	ORIG.	RED	T1	26	58	R1	GRY	
LINE 5		YEL	E	27	59	M	RED/BLK	LINE 10
		VIO	T	28	60	R	RED/YEL	
	TERM.	GRN	T1	29	61	R1	RED/GRN	
		BLU	E	30	62	M	TAN	
		BRN	GND	31	63	GND	BRN	
		BRN	GND	32	64	GND	BRN	

7. AM1 PLUS-D, T1 DIGITAL BASIC UNIT

7.01 INTRODUCTION

This section describes physical and functional features that are distinct to the AM1 PLUS-D T1 Digital Basic Unit. See Section 4 for features that are common to all Basic Units.

The paragraphs in this section are listed below:

7.02 General
7.03 Front Panel Components
7.04 T1 Span Cables
7.05 T1 Span Connections
7.06 Operation Notes

7.02 GENERAL

The AM1 PLUS-D has three (3) identical T1 Span Interface Cards, installed behind the front panel; they are labeled "T1 B", "T1 C" and "T1 D". All adjustments on the cards can be made from the front panel; there are no address DIP switches on these cards; each card knows automatically in which slot it is installed.

The AM1 PLUS-D has connections for three (3) T1 Span Lines over which calls can be originated and terminated. Each T1 Span has 24 Channels at 1.544 Mbps (DS-1), 12-frame multiframe, with D3/D4 Format and DSX-1 standard levels. Note the following concerning the T1 Channels:

A. Since each T1 Span has 24 Channels, there are a total of 3 x 24 = 72 Channels available.
B. Only 60 of the 72 Channels in an AM1 PLUS-D can be programmed at any one time; any 60 can be chosen: 30 for Originate Ports and 30 for Terminate Ports;
C. Any channel can be programmed as either an Originate Port or a Terminate Port.

The AM1 PLUS-D can control a Set of 30 dual-port Lines (30 Originate Ports and 30 Terminate Ports) with many possible combinations of T1, loop/ground start and E&M ports:

A. 60 T1 Channels (30 programmed as Originate Ports and 30 programmed as Terminate Ports) can be programmed in the AM1 PLUS-D itself.
B. An Expansion Unit can be connected to include up to 20 dual-port loop/ground start and/or E&M Lines. See Fig. 12.11.
C. Up to 15 AM1 PLUS-D Basic Units can be chained together for a maximum of 45 T1 Span Lines per system. See Para. 14.11.

See Para. 10.03 for notes on assigning ports.

NOTE

A T1 Adaptor cannot be connected to an AM1 PLUS-D. A T1 Adaptor is not needed because a full Set (30 Originate and 30 Terminate Ports) of T1 Channels can be programmed from the AM1 PLUS-D Basic Unit itself. See Para. 8.07 and 8.08 concerning T1 Adaptors.

7.02 GENERAL, continued

Terminology. Definitions of terms used in this section:

-DSX: Digital Signal Cross-Connect. A distribution frame in a Central Office (CO) where Digital Lines and equipment are interconnected. The signal levels and pulse shape are standardized at this interface. The DSX-1 patch panel is a good place to connect an AM1 PLUS-D.

-Mbps: Megabits (millions of bits) per second. Unit of frequency for digital bit stream.

-D3/D4 Format: A format used in a D3/D4 Channel Bank. A Channel Bank interfaces between digital T1 trunks and individual analog subscriber lines.

-ORB: Office Repeater Bay

7.03 FRONT PANEL COMPONENTS (Fig. 7-1)

Component Location. The Front Panel of an AM1 PLUS-D Basic Unit is illustrated in Fig. 7-1. Detailed views are shown of:

A. The (Originate) PORT ENABLE DIP Switches

B. Span Interface Card components that come out to the front panel; the components are identical for each of the (3) span cards and apply to the respective span (B, C or D).

The numbering of the descriptions below corresponds to the numbering of the components in Fig. 7-1. See Fig. 4-1 for descriptions of the other Front Panel components.

(1) Originate PORT ENABLE DIP Switches. These DIP switches are numbered from 1 thru 30, representing the 01 thru 30 T1 Originate Ports that can be programmed. Set the respective DIP switch to ON to "enable" the T1 Channel programmed for the Originate Port of that Line. These DIP switches do not affect the Terminate Ports. An "enabled" port is capable of originating calls after a START command; see Para. 13.03.

NOTE

With its DIP Switch ON, an Originate Port is enabled/disabled with the Line Enable parameter described in Para. 10.02. With its DIP switch OFF, an Originate Port is disabled, regardless of the setting of the Line Enable parameter.

EXAMPLE: Refer to the Line assignments shown in the example chart in Para. 7.06.

set DIP Switch 1 to ON to enable Originate Port B-01
set DIP Switch 14 to ON to enable Originate Port C-07
set DIP Switch 29 to ON to enable Originate Port D-17
etc.

PORT ENABLE DIP switches of ports that have not been programmed with a T1 Channel Originate Port do not have any effect; they can be set either OFF or ON. For example, if Originate Port 11 were programmed as A-11, using the first analog line of an AM1E PLUS-11 Expansion Unit, this Originate Port would be enabled with the Expansion Unit Port Enable Toggle Switch.

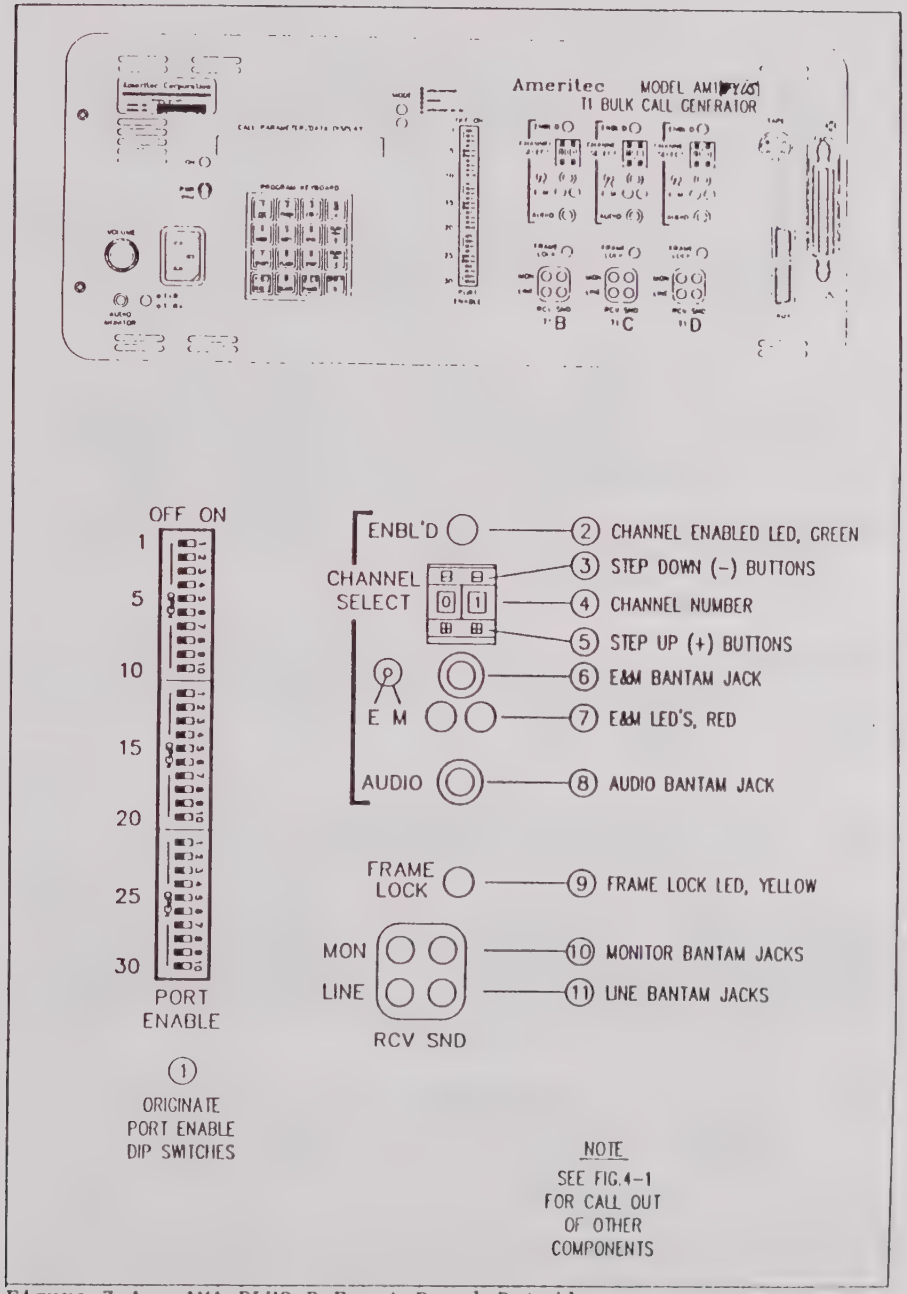


Figure 7-1. AM1 PLUS-D Front Panel Detail

7.03 FRONT PANEL COMPONENTS (Fig. 7-1), continued

APPLICATION NOTES Concerning Front Panel Components:

A. The PORT ENABLE DIP Switches (item 1) are associated with all three (3) T1 Spans (B, C and D) of the AM1 PLUS-D. Any Channel of any of the T1 Spans can be programmed as any of the 30 possible Originate Ports.

B. Observe the heavy-line bracket enclosing the upper components of the Span Interface Card. This bracket identifies the monitoring components (items 2 thru 8, explained below) that are associated with the single T1 Channel whose number appears in the CHANNEL SELECT windows.

C. Items 9 thru 11 are associated with the T1 Line (containing 24 Channels) of the respective Span Interface Card.

(2) Channel Selected Enabled (ENBL'D) LED, Green.

A. When this LED is ON, it indicates that the Channel being monitored (indicated by the number in the CHANNEL SELECT window) has been programmed ("ENaBLeD") as an Originate or Terminate Port per Para. 10.04 and 10.05; activity on this channel is monitored by the E&M Jack/LEDs and the AUDIO Jack.

B. When this LED is OFF, it indicates that the monitored Channel has not been assigned as an Originate or Terminate port; the Channel is not being used and is free to be assigned.

(3) Step Down Buttons (2). These Buttons are used to select the Channel to be monitored. Press Buttons to step backwards (9, 8, 7, ... 0) until the Number of the desired Channel (01 thru 24) appears in the windows (item 4). Each of these Buttons is marked with a "-".

NOTE

Some AM1 PLUS-D units may have Thumb Wheels instead of Buttons (items 3 and 5) to select the Channel to be monitored.

(4) CHANNEL SELECT: Number of Channel Selected for Monitoring. Acceptable range of numbers is 01 thru 24 for the 24 Channels of the T1 Span; other numbers have no meaning. The Number in the windows is the Channel that is being monitored at the AUDIO jack and E&M jack (and LEDs). The monitored Channel may or may not be assigned (enabled) as an Originate or Terminate Port as indicated by the ENBL'D LED (item 2).

NOTE

The CHANNEL SELECT chooses a channel for monitoring only; it does not assign the channel to a particular port. Originate and Terminate Port assignments are made with Line Parameters (Para. 10.03 thru 10.05).

(5) Step Up Buttons (2). These Buttons are used to select the Channel to be monitored. Press Buttons to step forward (0, 1, 2, ... 9) until the Number of the desired Channel (01 thru 24) appears in the windows (item 4). Each of these Buttons is marked with a "+".

7.03 FRONT PANEL COMPONENTS (Fig. 7-1), continued

(6) E&M Monitor Bantam Jack. E&M lead activity on the selected Channel (per item 4) is monitored at this jack. An oscilloscope or strip chart recorder could be connected to this jack to view the E&M signaling bit activity in the T1 bit stream.

(7) E&M LEDs, Red. The "E" LED is to the left and the "M" LED to the right. These LEDs turn ON when the respective signaling bit is "true". Typically, the "E" LED lights with Originate Port off-hook (Send, SND, signaling bit A), followed by the "M" LED momentarily lighting, indicating the arrival of the wink, start signal (Receive, RCV, signaling bit A).

(8) AUDIO Monitor Bantam Jack. This provides access to the decoded audio of the selected Channel (per item 4). This jack is especially useful to audibly monitor activity on the selected Channel. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the selected Originate or Terminate Port, depending to which port the monitored Channel has been programmed; see Para. 13.05 under "Audio Monitor".

(9) FRAME LOCK LED, Yellow.

A. When this LED is ON:
   1. The T1 signal connected at the RCV LINE Jack (item 11) is valid (within proper specification).
   2. The AM1 PLUS-D is "locked" onto the incoming T1 signal.

B. If this LED is OFF, the RCV LINE T1 signal is not properly connected and/or is not to specification.

The AM1 PLUS-D uses the incoming T1 signal as a reference to generate the Send (SND) T1 signal. Activity on the E&M LEDs is only meaningful if the FRAME LOCK LED is ON.

(10) T1 Line Monitor (MON) Bantam Jacks. These contacts, MON RCV (Monitor Receive) and MON SND (Monitor Send) are wired in parallel with the RCV LINE and SND LINE jacks, respectively (item 11). Extra equipment can be conveniently connected at these jacks.

(11) T1 LINE Bantam Jacks. RCV LINE (Receive Line) and SND LINE (Send Line). These are the input/output (I/O) connections which are normally connected to a DSX-1 patch panel.

Typically, the RCV LINE is connected to the OUT of the Digital Switch, i.e. the Transmit (Send) of the external T1 line; the SND LINE is connected to the IN of the Digital Switch, i.e. the Receive of the external T1 line. See Para. 7.05 and Fig. 7-3 for more details concerning connections.

7.04 T1 SPAN CABLES

Two (2) cables are required per T1 Port to connect the RCV and SND Bantam Jacks to the external T1 Span. The cables used must have a Bantam Plug on one end to connect to the AM1 PLUS-D and a plug on the other end compatible with the DSX-1 patch point.

Ameritec cables (each 6 Ft.) that can be used with an AM1 PLUS-D are shown in Fig. 7-2 . Use the 48-0047 to connect to a DSX-1 Bantam Jack and the 48-0048 to connect to a Longframe (310) Jack.

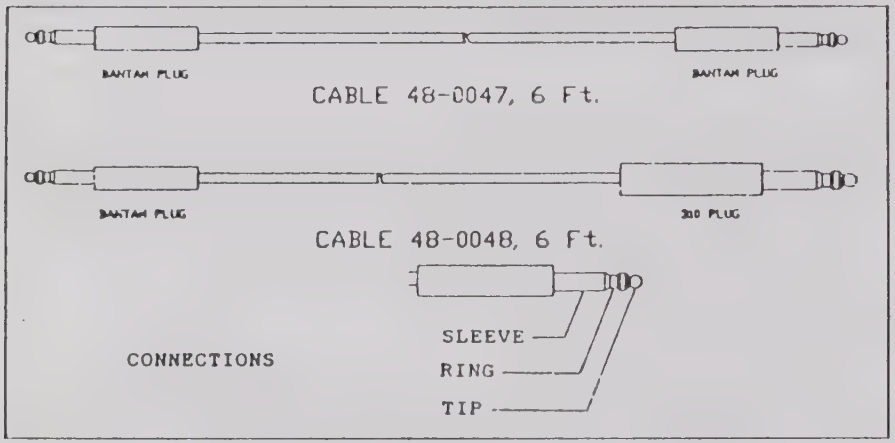


Figure 7-2. AM1 PLUS-D Cables

7.05 T1 SPAN CONNECTIONS

System Size. The AM1 PLUS-D is equipped with three (3) separate T1 ports. Up to 15 AM1 PLUS-D Basic Units can be chained together for a maximum of 45 Span Lines per System; see Para. 14.11 concerning chaining. As a practical matter, however, there is no limit of Span Lines per "system"; this is because calls can be originated from one AM1 PLUS-D Basic Unit or System and terminated to the same AM1 PLUS-D Basic Unit or System, or to a totally unrelated unit or system.

T1 Line Requirement. Remember: the AM1 PLUS-D does not generate a T1 signal all by itself; it requires a valid incoming T1 signal (1.544 Mbps, 24-Channel PCM, 12-frame multiframe, D3/D4 format, 1.5V peak minimum pulse amplitude) at the RCV port which it uses as a reference to regenerate the T1 signal that is transmitted out the respective SND port.

Sources of T1 Lines. A DSX-1 patch panel is an ideal place to connect an AM1 PLUS-D because the T1 signals accessible at a DSX are maintained to standard specifications. Other sources of T1 lines are listed below:

- -The Ameritec AM7 C.O. Simulator is capable of supplying up to four (4) T1 lines; the AM7 can be purchased or rented.
- -The telephone company leases T1 lines.
- -T1 trunk on PBX.

7.05 T1 SPAN CONNECTIONS, continued

Typical Connections. At a DSX-1 patch panel, the AM1 PLUS-D can be connected to the Local Digital Switch or to the Office Repeater Bay (ORB). For either case,

A. Connect the RCV LINE of the AM1 PLUS-D to the OUT of the DSX-1 equipment.
B. Connect the SND LINE of the AM1 PLUS-D to the IN of the DSX-1 equipment.

See illustration in Fig. 7-3.

After making the connections, and turning ON the power, check the yellow FRAME LOCK LED for each T1 line. If the cables are connected properly, the FRAME LOCK LED will be ON.

NOTE

Do not connect the AM1 PLUS-D Terminate Ports to circuits that will be sent Dial Pulses by the switch under test. A break in the incoming seizure signal (RCV signaling bit A) at the Terminate Port is interpreted as an on-hook (call aborted).

Connection to Local Digital Switch. Usually, the AM1 PLUS-D is connected to load the Local Digital Switch; when this connection is made:

A. The connection between the Span Line and the Local Digital Switch is broken.
B. The AM1 PLUS-D is connected "directly" to the Local Digital Switch.

Connection to ORB. Also, the AM1 PLUS-D can be connected to the ORB to load the T1 facilities and the Remote Digital Switch. For proper operation, the distance to the first repeater must be less than 500 feet.

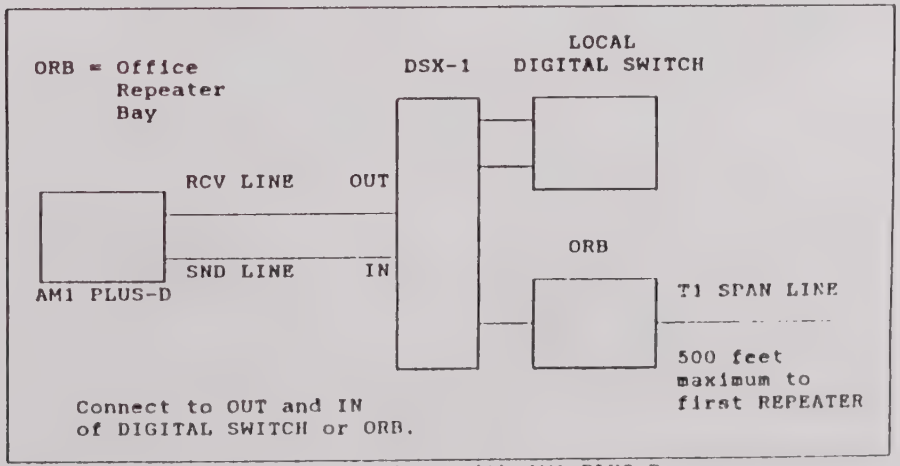


Figure 7-3. Typical Connections with AM1 PLUS-D

7.06 OPERATION NOTES

See Para. 10.03, 10.04, 10.05 and 10.15 for special Line Parameters that appear for an AM1 PLUS-D. Note that Wink start is the default Start Signal for T1 lines (Para. 10.07,A,2).

EXAMPLE: Use Line Parameter prompts in Para. 10.04 and 10.05 to make Line assignments per the chart below: 20 Channels (01 thru 20) are used from each of the Spans B, C and D -- a total of 60 Channels: 30 Originate and 30 Terminate.

LINE	1	2	3	4	5	6	7	8	9	10	11	etc. thru	30
ORIGINATE PORT	B-01	B-03	B-05	B-07	B-09	B-11	B-13	B-15	B-17	B-19	C-01	.....	D-19
TERMINATE PORT	B-02	B-04	B-06	B-08	B-10	B-12	B-14	B-16	B-18	B-20	C-02	.....	D-20

PORT ENABLE DIP Switches (item 1)* enable/disable the Originate Port Channels as indicated in the list below:

DIP SWITCH	ORIGINATE PORT	DIP SWITCH	ORIGINATE PORT	DIP SWITCH	ORIGINATE PORT
1	B-01	11	C-01	21	D-01
2	B-03	12	C-03	22	D-03
3	B-05	13	C-05	23	D-05
4	B-07	14	C-07	24	D-07
5	B-09	15	C-09	25	D-09
6	B-11	16	C-11	26	D-11
7	B-13	17	C-13	27	D-13
8	B-15	18	C-15	28	D-15
9	B-17	19	C-17	29	D-17
10	B-19	20	C-19	30	D-19

Follow steps below to practice using the front panel components:

1. Go to CHANNEL SELECT Step Up/Down Buttons (items 3 and 5) for Span B.
2. Press Buttons as necessary until "09" appears in the CHANNEL SELECT windows (item 4). Channel 09 of Span B is the Originate Port of Line 05.
3. ENBL'D LED (item 2) will light, indicating that Channel 09 has been programmed (assigned as a port).
4. Set PORT ENABLE DIP Switch 5 (item 1) to ON to enable Channel 09 of Span B. Calls can now be originated through this channel.
5. Connect the 2' Bantam-to-Bantam cable (provided) from the AUDIO Jack (item 8) of Span B to the AUDIO MONITOR Jack (item 8 in Fig. 4-1). When a START command is given (Para. 13.03), activity (digits being outpulsed, etc.) on this Originate Port will be monitored with the AM1 PLUS-D speaker.
6. E&M LEDs (item 7) will light per the signaling bit activity on Channel 09 during the course of the calls.
7. Repeat steps 1 and 2, except select Channel 21.
8. ENBL'D LED (item 2) will not light, indicating that Channel 21 has not been programmed -- Channel 21 of Span B is not used in this example.

* Item numbers refer to Fig. 7-1, unless otherwise specified.

8. EXPANSION UNITS AND T1 ADAPTOR UNITS

8.01 INTRODUCTION

This section describes physical and functional features that are distinct to Expansion Units (models AM1E PLUS and AM1EXT) and T1 Adaptor Units (models AMT1-1 and AMT1-2). See Sections 4 thru 7 for descriptions of Basic Units. The paragraphs in this section are listed below:

8.02 EXPANSION UNITS: GENERAL INFORMATION
8.03 AM1E PLUS-1 Analog Expansion Unit
8.04 AM1EXT-2 E&M/Loop Expansion Unit
8.05 AM1E PLUS-3 Split (E&M/Analog) Expansion Unit
8.06 AM1EXT-4 E&M Expansion Unit
8.07 AM1T1-1 Digital Adaptor Unit
8.08 AM1T1-2 Digital Adaptor Unit

8.02 EXPANSION UNITS: GENERAL INFORMATION

See Para. 12.03 for guidelines to connect an Expansion Unit and/or a T1 Adaptor Unit to a Basic Unit. See Fig. 16-4 for functional block diagram of an Expansion Unit.

See Fig. 1-4 thru 1-7 for illustrations and the types of port interfaces of the four (4) different Expansion Unit models; Para. 8.03 thru 8.06 give detailed information about each individual model. Note the following concerning all Expansion Units:

A. Any one Expansion Unit can connect to any one Basic Unit. See Fig. 12-7 for possible interconnections.
B. Each Expansion Unit adds a total of 20 dual-port (Originate/Terminate) lines to the lines of the Basic Unit.
C. A 48-0001 Expansion (ribbon) Cable is used to connect an Expansion Unit to a Basic Unit; a 48-0001 Cable is supplied with each Expansion Unit; see Fig. 8-1.
D. There is an 18-pair female connector, labeled "EXP'N", on the far right side of the front panels of each Expansion Unit and each Basic Unit. The Expansion Cable is connected between these two (2) connectors; see Fig. 12-9 thru 12-11 for some typical interconnections.
E. Each Expansion Unit is powered and controlled from the Basic Unit to which it is connected. Install the 48-0001 Cable before turning on the power on the Basic Unit. Be sure to see Para. 3.08 for detailed powering procedures.

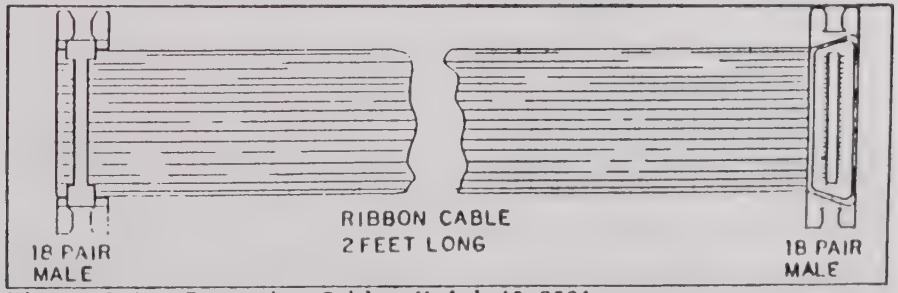


Figure 8-1. Expansion Cable, Model 48-0001

8.03 AM1E PLUS-1 ANALOG EXPANSION UNIT

See Fig. 1-4 for an illustration of the AM1E PLUS-1. The AM1E PLUS-1 has 20 dual-port loop/ground start Line Cards, identical to those in the AM1 PLUS-1 Basic Unit (Fig. 5-1). The information in Para. 5.03 thru 5.07 also applies to the AM1E PLUS-1. See Para. 8.02 for general information about Expansion Units.

NOTE

When an AM1E PLUS-1 Expansion Unit is connected to an AM1 PLUS-2 E&M Basic Unit, use the ports in Loop Start only. Ground Start operation can not be used with the E&M Basic Unit.

Line Cable Panel-Mount Adaptors. The port connections of the AM1E PLUS-1 can be made to two (2) 25-pair Amphenol connectors instead of the individual modular line jacks. The method used is identical to that described in Para. 5.08 for the AM1 PLUS-1 Basic Unit. The only difference is that two (2) 48-0018 Panel Adaptors are mounted to the front panel instead of one.

Figure 8-2 shows the 48-0018 Adaptors mounted on the Front Panel of an AM1E PLUS-1. This allows convenient connect/disconnect of all contacts with mating 25-pair male Amphenol Connectors. The pin assignment for each 48-0018 is listed in Table 5-2, substituting connections of "Line #11 thru #20" and "Line #21 thru #30" for "Line #1 thru #10" respectively.

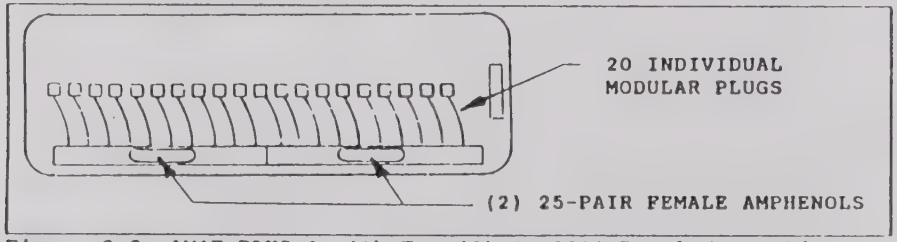


Figure 8-2. AM1E PLUS-1 with Two (2) 48-0018 Panel-Mount Adaptors

See Fig. 5-5 for illustrations of the three (3) types of cables available that connect to a 48-0018 Panel-Mount Adaptor.

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT

The AM1EXT-2 Expansion Unit has:
20 2-wire or 4-wire E&M Originate Ports and
20 loop Terminate Ports
See Para. 15.04 for notes on E&M signaling. See Para. 8.02 for general information about Expansion Units.

A. Front Panel Components (Fig. 8-3)

Component Location. The Front Panel of an AM1EXT-2 Expansion Unit is illustrated in Fig. 8-3. A detailed view is shown of the -48 Vdc power connections and the Line Card components that come out to the Front Panel; the Line Card components are the same

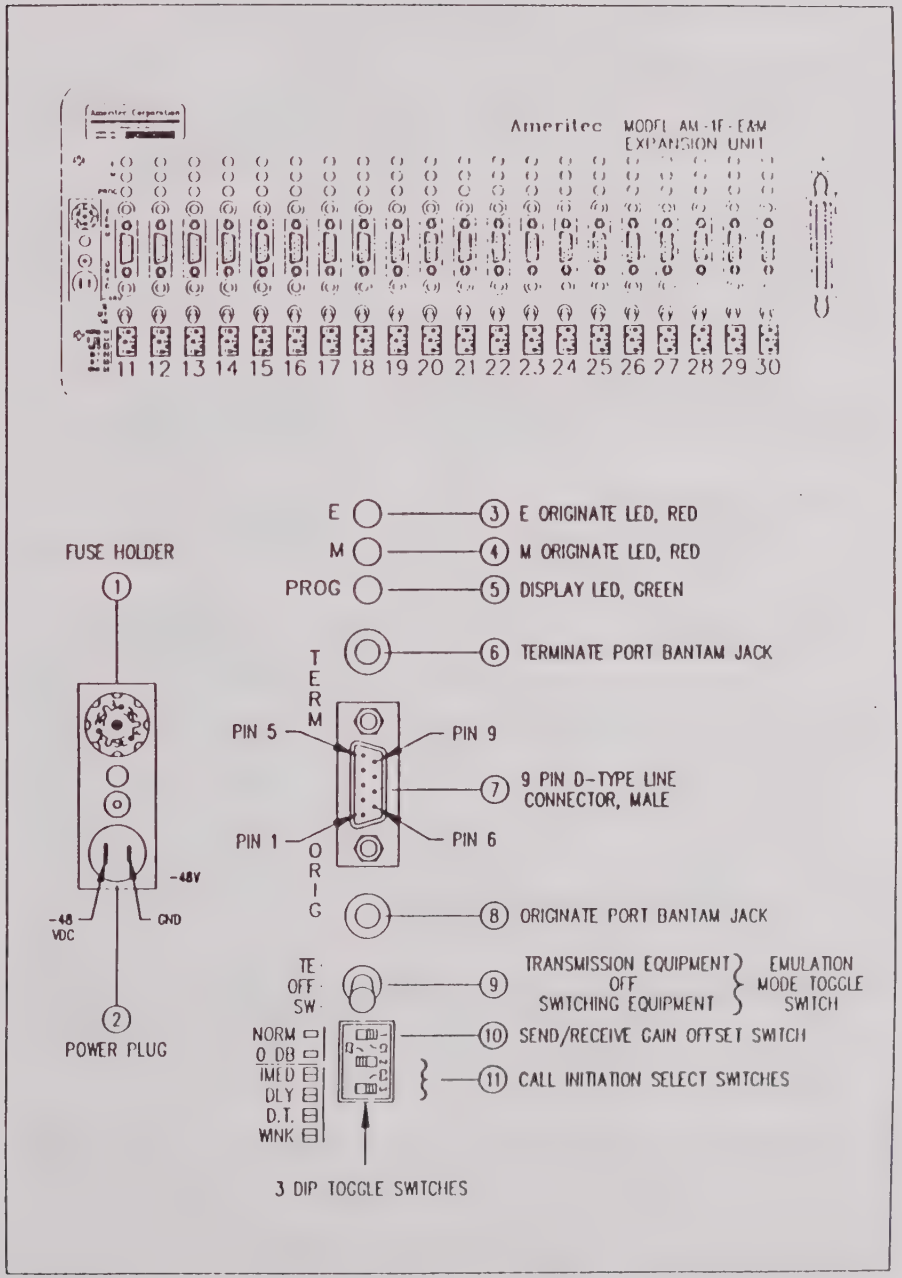


Figure 8-3. AM1EXT-2 Front Panel Detail

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT, continued

A. Front Panel Components (Fig. 8-3), continued
Component Location, continued
for each of the (20) Line Cards. The numbering of the descriptions below corresponds to numbers of the components in Fig. 8-3.

(1) Fuse Holder. Unscrew to check or replace 2 Amp fuse.

(2) -48 Vdc Plug. Connect the 48-0043 Power Cord (supplied) to this plug. Connect Black alligator clip to Ground and Red alligator clip to -48 Vdc. The 48-0043 Cable is shown in Fig. 3-1. Note: -48 Vdc is used for signaling purposes, not to power the unit; unit is powered from the Basic Unit to which it is connected. See Para. 3.08 for powering procedures.

(3) E Originate LED, Red. This LED lights as indicated below per emulation mode and the state of the AM1 PLUS and Switch:
T.E. mode: Originate Port off-hook. Blinks when dialing.
SW. mode: Switch is off-hook (sending "M" answer supervision).

(4) M Originate LED, Red. This LED lights as indicated below per emulation mode and the state of the AM1 PLUS and Switch:
T.E. mode: Lights momentarily when the Wink (start signal) arrives. Lights continuously with "M" lead answer supervision.
SW. mode: AM1 PLUS Originate Port off-hook.

(5) Display (PROG) LED, Green. Lights when this line is selected (see "Line Select Prompt" in Para. 4.11). When "PROG" LED is lit, Line Parameters of this line are being PROGrammed or reviewed on Display. This LED flashes when this line is stopped in Automatic Stop-on-Trouble Mode (Para. 9.03). This LED indicates "selected" line for printouts; see Para. 14.09,A.

(6) TERMinate Port Bantam Jack. Located above the D-type Connector, this provides access to the Terminate Port Tip and Ring (loop) connections. This jack is especially useful to audibly monitor activity at the Terminate Port of the line. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the Terminate Port; see Para. 13.05 under "Audio Monitor".

(7) 9-Pin D-Type Line Connector, Male. Outside pin locations (1, 5, 6, 9) are given in Fig. 8-3. The pin assignments for this connector are listed in Table 8-2; also given are the wire colors in the cable of the mating connector. See Para. 8.04,E and Fig. 8-6 for descriptions of the different cables available that plug into this connector.

(8) ORIGinate Port Bantam Jack. Located below the D-type Connector, this provides access to the Originate Port Tip and Ring connections. This jack is especially useful to audibly monitor activity at the Originate Port of the line. Connect the 2' Bantam cable (provided) between this jack and the AUDIO MONITOR jack to listen to activity at the Originate Port; see Para. 13.05 under "Audio Monitor". In the case of 4-Wire, both T/R (send pair) and T1/R1 (receive pair) are monitored simultaneously; the T/R and T1/R1 audio is superimposed.

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT, continued

A. Front Panel Components (Fig. 8-3), continued

⑨ Emulation Mode Toggle Switch (TE/OFF/SW). This is a 3-position switch.

a. Set the switch UP to enable the Originate Port to emulate Transmission Equipment (T.E.) originating calls into an E&M port of a Switch.

b. Set the switch DOWN to enable the Originate Port to emulate Switching Equipment (SW.) originating calls into E&M Transmission Equipment.

With this switch in TE or SW position, a START command (Para. 13.03) will apply ground to the E lead or -48 Vdc to the M lead per Table 8-1, starting the Call Sequence (Table 13-1).

With this switch in the OFF (middle) position, a START command will not result in the events described in Table 8-1; this prevents the Originate Port from coming off-hook.

NOTE

This switch only affects the Originate Port. Programmed Terminate Ports will respond when the AM1EXT-2 is running or in the FINISH mode, regardless of this switch position.

Remote ON/OFF Control. If this switch is left in one of the enable positions (TE or SW), it can be turned ON and OFF using the Line Enable prompt (Para. 10.02). This is a useful feature for remote control through the RS232 port (Para. 14.14).

⑩ ⑪ DIP Toggle Switches -- three (3) Toggle Switches, mounted in a Dual In-line Package (DIP). These switches perform two (2) functions as described below in Para. 8.04,B and C.

B. Send/Receive Gain Offset (Fig. 8-4)

The Top switch (item 10 in Fig. 8-3) of the DIP Toggle Switches controls the Offset of the Send/Receive Gain on a per-line basis. Each dual-port line can be individually configured with or without the offsets. Figure 8-4 shows the switch positions and lists the associated offsets. The offsets for the NORMal position simulate carrier Transmission Level Points (TLP) that are commonly found at the output of Transmission Equipment or Switching Equipment in the telephone network. The position of the Emulation Mode Toggle Switch (item 9, Fig. 8-3) determines whether a line emulates Transmission Equipment or Switching Equipment.

Send Gain Offset. The Tone Dialing Output Level prompt, Para. 10.22, sets the Low and High Band levels for Tone Dialing.

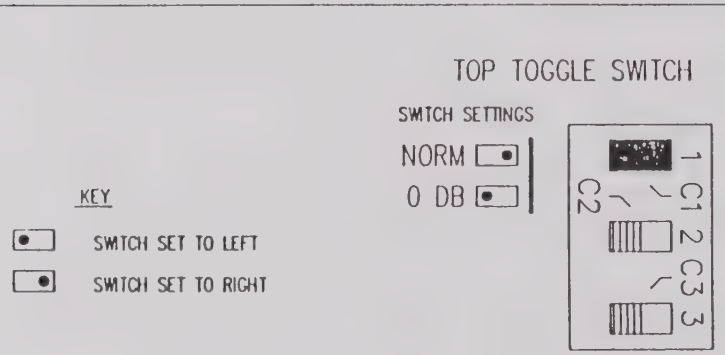
1. When emulating Transmission Equipment (T.E.), NORM switch position offsets the Low and High Band levels by +7 dB.
2. When emulating Switching Equipment (SW.), NORM switch position offsets the Low and High Band levels by -16 dB.
3. With a 0 DB switch position, the Low and High Band levels remain as set by the prompt of Para. 10.22.

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT, continued

B. Send/Receive Gain Offset (Fig. 8-4), continued

EXAMPLE: Low/High Band levels are set for -06/-06 per prompt in Para. 10.22. Emulation is for Switching Equipment (SW.). Gain Offset Switch is in NORM position. From Fig. 8-4, the Low/High Send levels will be offset by -16 dB.

Therefore, Low/High Band Tones will be outpulsed at:
-6 -16/-6 -16 = -22/-22 dBm.
The Receive Gain will be offset by +7 dB.



SWITCH SETTING	T/R (SEND) OFFSET	T1/R1 (RECEIVE) OFFSET
0 DB	0 dB	0 dB
NORM (SW. MODE)	-16 dB	+7 dB
NORM (T.E. MODE)	+7 dB	-16 dB

T.E. = Emulates Transmission Equipment
SW. = Emulates Switching Equipment

Figure 8-4. Switch Positions for Send/Receive Gain Offset

C. Call Initiation Method (Fig. 8-5 and Table 8-1)

The Bottom two (2) switches (item 11 in Fig. 8-3) of the DIP Toggle Switches are used to select one of four (4) possible methods of Call Initiation on a per-line basis. Each dual-port line can be individually configured for Call Initiation type. Figure 8-5 shows the switch positions to select the desired method of Call Initiation. The events that occur for each method of Call Initiation are described in Table 8-1.

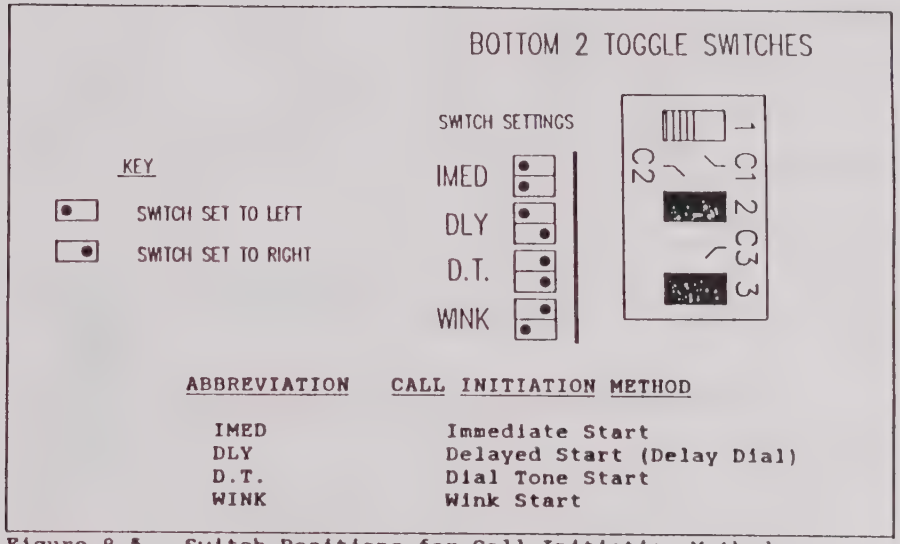


Figure 8-5. Switch Positions for Call Initiation Method

Table 8-1
Events for Each Call Initiation Method
(See Table 8-2 for Connector Pin Assignments)
T.E. = Transmission Equipment
SW. = Switching Equipment

CALL INITIATION	EVENTS	
	EMULATE T.E.	EMULATE SW.
Immediate Start	Ground applied to "E" (pin 4). Dialing follows 500 ms later.	-48 Vdc applied to "M" (pin 4). Dialing follows 500 ms later.
Delayed Start (Delay Dial)	Ground applied to "E" (pin 4). Dialing follows after "M" (pin 8) goes to ground.	-48 Vdc applied to "M" (pin 4). Dialing follows after "E" (pin 8) goes to -48 Vdc.
Dial Tone Start	Ground applied to "E" (pin 4). Dialing follows after Dial Tone is sensed on T and R (pins 3 and 7) for 2-wire E&M or T1 and R1 (pins 2 and 6) for 4-wire E&M.	-48 Vdc applied to "M" (pin 4). Dialing follows after Dial Tone is sensed on T and R (pins 3 and 7) for 2-wire E&M or T1 and R1 (pins 2 and 6) for 4-wire E&M.
Wink Start	Ground applied to "E" (pin 4). Dialing follows after "M" (pin 8) winks to -48 Vdc and back to ground.	-48 Vdc applied to "M" (pin 4). Dialing follows after "E" (pin 8) winks to ground and back to -48 Vdc.

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT, continued

D. Line Connections: Signaling Circuit Interface

Line Numbers. The (20) line numbers, 11 thru 30, are labeled below the DIP Toggle Switches.

Emulation. The AM1EXT-2 can emulate either Transmission Equipment (T.E.) or Switching Equipment (SW.).

When the AM1EXT-2 emulates T.E., it is equivalent to the Signaling Circuit which directs calls to the Trunk Interface of a Switch. See Fig. 15-2 for block diagram of an AM1EXT-2 connected to a Switch.

When the AM1EXT-2 emulates SW., it is equivalent to the Trunk Interface of a Switch which directs calls to the Signaling Circuit of Transmission Equipment. See Fig. 15-3 for block diagram of an AM1EXT-2 connected to Transmission Equipment.

Configuration. The AM1EXT-2 can be configured for either 2-wire E&M or 4-wire E&M Originate:

-For 2-wire E&M, use T, R, E and M contacts.
-For 4-wire E&M, use T, R, T1, R1, E and M contacts.

The Terminate Ports are always loop.

E. Line Cables (Fig. 8-6 and Table 8-2)

There are three (3) types of Line Cables available to connect to the D-type Line Connectors. Each Line Cable is 10 feet long and has 9 wires. Select between far-end connections of open (plain wires), minigator clips, or sleeves (hollow tubes which slide over either .045 square or .030 x .060 wire-wrap pins). The Line Cables are illustrated in Fig. 8-6, together with Model Numbers. Pin assignments and wire color-coding are listed in Table 8-2.

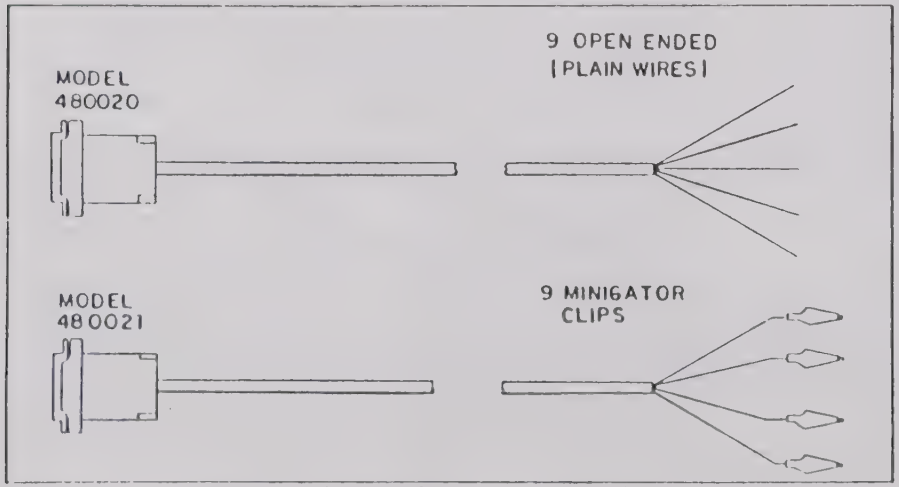


Figure 8-6. AM1EXT-2 Line Cables (2 of 3 cables)

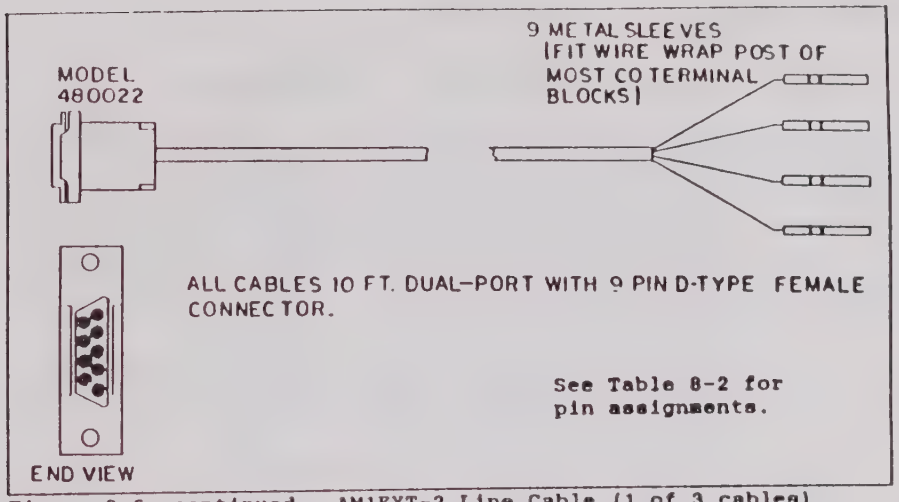


Figure 8-6, continued. AM1EXT-2 Line Cable (1 of 3 cables)

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT, continued

E. Line Cables (Fig. 8-6 and Table 8-2), continued

Wire color-coding and pin assignments for Cables 48-0020, 48-0021, and 48-0022 (Fig. 8-6) are listed in Table 8-2.

Table 8-2
Pin Assignments and Color-Coding for Line Cables
(9-Pin D-Type Connector, Female)

PIN	CABLE WIRE COLOR	CONNECTION
1	Brown	Ground
		ORIGINATE CONNECTIONS
3	Orange	Tip (T) } SND
7	Violet	Ring (R) } SND
2	Red	Tip 1 (T1) } RCV
6	Blue	Ring 1 (R1) } RCV
4	Yellow	"E" if T.E., "M" if SW.
8	Slate	"M" if T.E., "E" if SW.
		TERMINATE CONNECTIONS
5	Green	Tip (T)
9	White	Ring (R)

NOTES
T.E. = Emulates Transmission Equipment
SW. = Emulates Switching Equipment

The Ground wire (Pin 1, Brown) of at least one dual port cable must be connected to Switch Ground.

8.04 AM1EXT-2 E&M/LOOP EXPANSION UNIT, continued

F. Line Cable Rack-Mount Panel Adaptor (Model 36-0002)

Another way to make connection to the lines is to use an optional Rack-Mount Panel Adaptor (Model 36-0002). This panel mounts in a 19" relay rack below a rack-mounted AM1EXT-2. It occupies 3 1/2" of vertical rack space and has 20 individual D-type connectors which are plugged into the Line Card connectors. The dual-port connections of the Line Cards are brought down to three (3) 25-pair (50-pin) female Amphenol connectors. Convenient connect/disconnect of all contacts is made with mating 25-pair male Amphenol Connectors.

The 36-0002 Rack-Mount Panel Adaptor is similar to the Model 36-0004, illustrated in Fig. 8-7. The 36-0002 has three (3) Amphenol connectors, however, instead of four (4).

8.05 AM1E PLUS-3 SPLIT (E&M/ANALOG) EXPANSION UNIT

See Fig. 1-6 for an illustration of the AM1E PLUS-3. See Para. 8.02 for general information about Expansion Units. The AM1E PLUS-3 is a "split" Expansion Unit that is equipped with:

A. Eight (8) dual-port E&M/loop line cards, identical to those in the AM1EXT-2 (Fig. 8-3). The information in Para. 8.04,A thru 8.04,E also applies to these ports.

B. 12 dual-port loop/ground start line cards, identical to those in the AM1 PLUS-1 (Fig. 5-1). The information in Para. 5.03 thru 5.07 also applies to these ports.

NOTE

When an AM1E PLUS-3 Expansion Unit is connected to an AM1 PLUS-2 E&M Basic Unit, use the 12 Loop/Ground Start ports in Loop Start only. Ground Start operation can not be used with the E&M Basic Unit.

Line Cable Panel-Mount Adaptor (Model 48-0018-12). A convenient way to connect to the 12 loop/ground start lines (Lines 19 thru 30) is to use an optional Panel-Mount Adaptor (Model 48-0018-12). This Adaptor is mounted on the Front Panel at the factory. It has 12 Modular Plugs which are connected to the Modular Jacks on the loop/ground start Line Cards. The connections of the 12 dual-ports are brought down to a single 25-pair (50-pin) female Amphenol Connector. This Panel Adaptor looks the same as the 48-0018 Panel Adaptor illustrated in Fig. 5-4, except it has 12 instead of 10 individual modular plugs. Pin assignments for the 48-0018-12 Adaptor are listed in Table 8-3.

8.06 AM1EXT-4 E&M EXPANSION UNIT

See Fig. 1-7 for an illustration of the AM1EXT-4 Expansion Unit. See Para. 8.02 for general information about Expansion Units. The AM1EXT-4 has 20 dual-port E&M Line Cards, identical to those in the AM1 PLUS-2 Basic Unit (Fig. 6-1). The information in Para. 6.03 thru 6.07 also applies to the AM1EXT-4.

Table 8-3
Pin Assignments for Panel-Mount Adaptor (48-0018-12)
25-Pair Amphenol, Female

PIN NUMBERS	CONNECTIONS
1 & 26	T & R Originate Line #19
2 & 27	T & R Terminate Line #19
3 & 28	T & R Originate Line #20
4 & 29	T & R Terminate Line #20
5 & 30	T & R Originate Line #21
6 & 31	T & R Terminate Line #21
7 & 32	T & R Originate Line #22
8 & 33	T & R Terminate Line #22
9 & 34	T & R Originate Line #23
10 & 35	T & R Terminate Line #23
11 & 36	T & R Originate Line #24
12 & 37	T & R Terminate Line #24
13 & 38	T & R Originate Line #25
14 & 39	T & R Terminate Line #25
15 & 40	T & R Originate Line #26
16 & 41	T & R Terminate Line #26
17 & 42	T & R Originate Line #27
18 & 43	T & R Terminate Line #27
19 & 44	T & R Originate Line #28
20 & 45	T & R Terminate Line #28
21 & 46	T & R Terminate Line #29
22 & 47	T & R Originate Line #29
23 & 48	T & R Terminate Line #30
24 & 49	T & R Originate Line #30
25 & 50	No Connection

8.06 AM1EXT-4 E&M EXPANSION UNIT, continued

Line Cable Rack-Mount Panel Adaptor (Model 36-0004). See Fig. 8-7. This optional panel mounts in a 19" relay rack below a rack-mounted AM1EXT-4. It occupies 3 1/2" of vertical rack space and has 20 individual D-type connectors which are plugged into the Line Card connectors. The dual-port connections of the Line Cards are brought down to four (4) 64-pin female Amphenol connectors. This adaptor allows convenient connect/disconnect of all contacts with mating 64-pin male Amphenol Connectors.

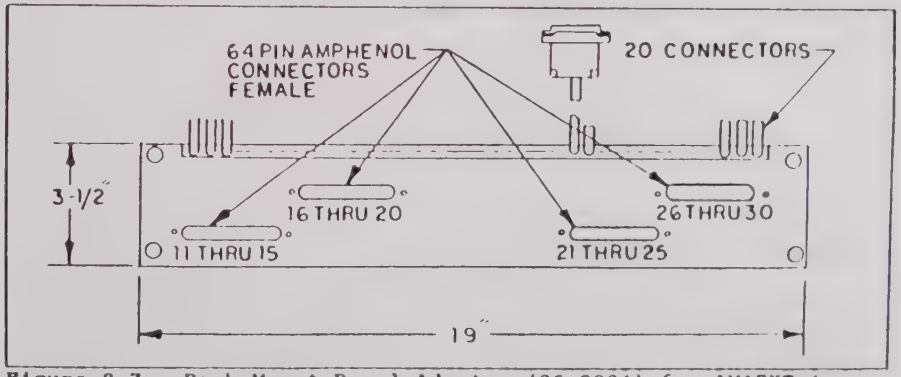


Figure 8-7. Rack-Mount Panel Adaptor (36-0004) for AM1EXT-4

EXPANSION UNITS AND T1 ADAPTOR UNITS

8.07 AM1T1-1 DIGITAL ADAPTOR UNIT

See Fig. 1-8 for an illustration of the AM1T1-1 Digital Adaptor Unit; see Fig. 16-5 for a functional block diagram. Note the following concerning the AM1T1-1:

A. The purpose of an AM1T1-1 is to add digital T1 lines to an analog-line Set. See Para. 12.03 for guidelines to connect a T1 Adaptor Unit to a Basic Unit.
B. Line interface components on the front panel are identical to those of AM1 PLUS-D Basic Unit (Fig. 7-1). Para. 7.03 thru 7.06 information also applies to the AM1T1-1.
C. An AM1T1-1 can be connected to either analog AM1 PLUS Basic Unit (AM1 PLUS-1 or AM1 PLUS-2).
D. A 48-0056 T1 Adaptor Cable is used to connect an AM1T1-1 to an analog Basic Unit. The 48-0056 Cable is supplied with each AM1T1-1; see Fig. 8-8.
E. There is a 37-pin female connector, labeled "TO DIGITAL ADAPTOR", at the top edge of each analog Basic Unit; there is also a 37-pin female connector, labeled "TO AM1XT", next to the PORT ENABLE DIP switches on an AM1T1-1. The T1 Adaptor Cable is connected between these two (2) connectors as shown in Fig. 8-9. See also Fig. 12-10 for a typical connection.
F. Each AM1T1-1 has its own power supply and power cord. See Fig. 3-1 and Table 3-1 for power cords and fuses. IMPORTANT: see Para. 3.08 for power up procedure.
G. An AM1T1-1 is controlled by the Basic Unit to which it is connected.

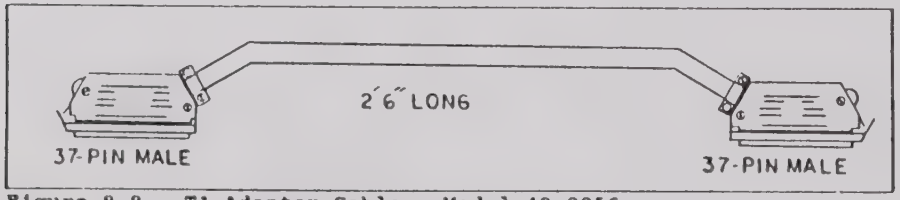


Figure 8-8. T1 Adaptor Cable, Model 48-0056

NOTE
For the AM1T1-1, a cover plate is installed over the right half of the unit, as shown in Fig. 1-8.

8.08 AM1T1-2 DIGITAL ADAPTOR UNIT

See Fig. 1-9 for an illustration of the AM1T1-2 Digital Adaptor Unit. This unit is two (2) AM1T1-1 Units (Para. 8.07) in a single package with one (1) power connector. Each half of the unit operates independent of the other, controlled by the Basic Unit to which it is connected. Connect as shown in Fig. 8-9 to form two (2) AM1 PLUS Sets. The two (2) 48-0056 Cables are supplied with the unit.

8.08 AM1T1-2 DIGITAL ADAPTOR UNIT, continued

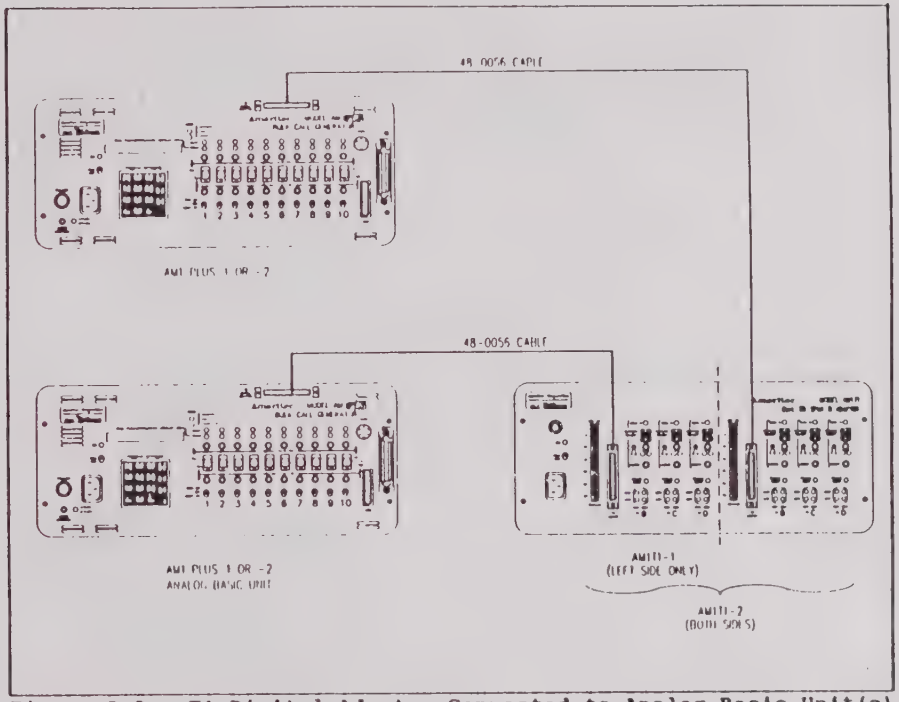


Figure 8-9. T1 Digital Adaptor Connected to Analog Basic Unit(s)

9. SETTING UNIT PARAMETERS

Introduction. This section describes how to set the AM1 PLUS Unit Parameters in preparation for a test run. Unit Parameters apply to all of the possible 30 lines that can be controlled by each Basic Unit. In addition to the Unit Parameters there are Line Parameters which are programmed individually for each line.
NOTE: **See Section 10 to set Line Parameters.**

Unit Parameters are set by scrolling through the parameter prompts and entering values per the desired application. There are two (2) ways to accomplish this:

A. With the Basic Unit, by entering the commands with the keyboard and monitoring the prompts and parameter settings on the LED display. See Para. 4.11 for instructions to scroll through prompts and enter values.
B. With a terminal connected to the RS232 port, by entering the commands with the terminal keyboard and viewing the prompts and parameter settings on the screen of the terminal monitor (CRT). The RS232 port is an option and must be ordered to be included with the AM1 PLUS unit. See Para. 14.06 for RS232 port operation instructions.

In this section, there is a paragraph dedicated to each Unit Parameter. The parameters are covered in the order in which they appear in the scroll. The following format is used:

A. The title of each paragraph is the name of the parameter.
B. Following the title is an illustration of the LED display for that parameter on the AM1 PLUS Basic Unit.
C. Under the illustration, the parameter display is shown as it appears on the screen of a terminal monitor connected through the RS232 port.
D. Then the possible entries for the parameter are defined or the range of acceptable values is given, as appropriate. The Recall "0" value is also given; see Para. 11.10 (SPECIAL FUNCTION B).
E. Explanatory and applications notes are then given.

The paragraphs in this section are listed below:

9.01 Unit Parameter Line Select
9.02 Real Time Clock
9.03 Operating Mode
9.04 Call Generation Mode
9.05 Automatic Hourly Data Printout
9.06 Real Time Error Report
9.07 Programmed Start and Finish Times
9.08 Wait Time
9.09 Cut-Through Delay Time
9.10 Power-On Telephone Number Recall
9.11 Power-On Parameter Recall
9.12 Last Recalled Telephone Numbers
9.13 Last Recalled Parameters
9.14 RS232 Port Baud Rate
9.15 RS232 Port Parity
9.16 Software Version
9.17 Unit Parameter Store/Recall

Introduction, continued

NOTE

This section assumes familiarity with AM1 PLUS parameter entry as described in Para. 4.11. The Unit Parameters described in this section are listed in Fig. 4-3 and also in the FOLDOUT at the end of the manual.

9.01 UNIT PARAMETER LINE SELECT

CALL PARAMETER/DATA DISPLAY

LINE 00;

In order to access the Unit Parameters from a Line Parameter or special function display:

A. Press [SEL LINE, A] to bring up the display shown above
B. Enter "00" for the Line number and
C. Press [ETR/STP PARAM, B]

The Real Time Clock display will appear, shown next (Para. 9.02).

NOTE

The Real Time Clock display appears automatically with a "cold start" power ON; see Para. 3.04.

9.02 REAL TIME CLOCK

CALL PARAMETER/DATA DISPLAY

CLOC 0000-010100;

The entry is in 24 hour time -- month, day, and year. Default value = CLOC 0000-010100 = 12:00 Midnight January 1, 2000. Set the clock for the time of day and the date.

EXAMPLES: CLOC 0930-012288 = 9:30 A.M. January 22, 1988
CLOC 1617-101890 = 4:17 P.M. October 18, 1990

Once this clock is set, it will keep time as long as the PWR switch is not turned OFF. When power is switched OFF, the display reverts to the default setting shown above. This clock is printed out with the reports through the RS232 port to indicate the time that the printout occurs.

NOTE

If power is removed from the AM1 PLUS Basic Unit because of a power failure or by pulling out the power cord and leaving the PWR switch in the ON position, the Real Time Clock will continue to run, powered by the CPU Board Memory Backup Battery (Para. 3.06).

9.03 OPERATING MODE

CALL PARAMETER/DATA DISPLAY

MODE AC=1 AS=2 1;

Possible entries:
- 1 = Automatic Continue (AC)
- 2 = Automatic Stop (AS) on trouble
- 3 = Manual

Recall "0" = 1, Automatic Continue

NOTE

The (2) MODE LEDs are above and to the right of the display on an AM1 PLUS Basic Unit. See item 16 in Fig. 4-1. The state of the MODE LEDs is shown to the right of each of the Operating Modes, explained below: ● = LED ON ○ = LED OFF

Automatic Continue. In this mode of operation, all lines will automatically make calls, one after the other, after a START command. The upper MODE LED lights for this setting. ● ○

Automatic Stop on Trouble. After a START command, all lines will automatically make calls, one after the other, until an error is encountered. As soon as an error is found on a line, that line will immediately stop, enabling the user to trouble shoot at the place in the call sequence where the error occurred. The green PROG LED on the analog Line Cards will flash to indicate the line is stopped. To facilitate trouble shooting with voicepath confirmation tone failures, the tone is sent periodically while the line is stopped. Lines without errors will continue to run. The lower MODE LED lights for this setting. ○ ●

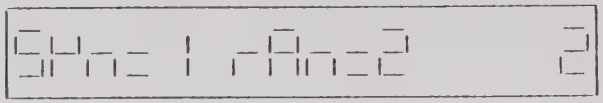
Manual. The user can step through the dialed number, one digit at a time, by repeatedly executing the START command. The upper and lower MODE LEDs will alternately flash for this setting; this alerts the user that the unit is not in a bulk call generation mode. ● ●

NOTE

The operating mode can be conveniently changed at any time using the [MODE] key; see Para. 13.02 for illustration of keys to press. Each time the [MODE] key is executed, the operating mode will step to another mode as evidenced by the MODE LEDs changing state. The Call Generation Mode prompt will also appear (see Para. 9.04), so that it too can be changed if desired. After the desired mode is set, press [ETR/STP PARAM, B] to return to the last enabled line prompt.

9.04 CALL GENERATION MODE

CALL PARAMETER/DATA DISPLAY



SYN=1 RAN=2 2;

Possible entries:
1 = Synchronous (SYN) mode of call generation
2 = Random (RAN) mode of call generation

Recall "0" = 2

Synchronous Mode. All originate ports always go off-hook simultaneously, unless the Start Delay line parameter settings (Para. 10.27) are different. This mode consumes more time than the Random Mode because the AM1 PLUS waits for all lines to complete their calls before bringing all lines off-hook to start the next synchronized set of calls. The line with the longest (slowest) call sequence determines the duration of each call for all lines.

NOTE

If equipped with RS232 Port, pins 5, 9 & 22 must be strapped for Synchronous Mode Operation; see Para. 14.05 and Fig. 14-2.

Random Mode. The originate ports operate independently from one another. Use this mode for maximum rate of call generation.

9.05 AUTOMATIC HOURLY DATA PRINTOUT

CALL PARAMETER/DATA DISPLAY

AUTO PRT NO=0 1;

Possible entries:
1 = Enable Automatic Hourly Data Printout
0 = Disable Automatic Hourly Data Printout
Recall "0" = 1

With the RS232 Option, if the Hourly Data Printout is enabled:

A. A printout will be delivered to the RS232 port every hour on-the-hour, according to the Real Time Clock of the AM1 PLUS.
B. The printout will contain a copy of all the data registers for all the lines. See Fig. 14-5 for an example printout. With an AM1 PLUS-D Basic Unit or with an Expansion Unit or T1 Adaptor connected, at least one of the line enable switches 20 thru 30 must be ON for the lines 20 thru 30 registers to be included in the printout.

9.06 REAL TIME ERROR REPORT

CALL PARAMETER/DATA DISPLAY

RT ERR YES=1 0;

Possible entries (Recall "0" = 0)
1 = enable Real Time Error (RT ERR) report
0 = disable Real Time Error (RT ERR) report

When the Real Time Error Report is enabled, an error message is delivered to the RS232 port at the time that the error occurs. In the report, the affected line is noted along with the time the error occurred. See Para. 14.08 and Fig. 14-6 for details.

NOTE

Be sure to disable the Real Time Error Report if the AM1 PLUS Basic Unit is not equipped with the RS232 Option or there is not a device connected to the RS232 port to receive the data. If the Real Time Error Report is enabled and no device is connected to the RS232 port, the error reports will accumulate inside the AM1 PLUS buffer and will cause the unit to slow down and eventually stop running.

9.07 PROGRAMMED START AND FINISH TIMES

CALL PARAMETER/DATA DISPLAY

ST 1 0000-010100;
FI 1 0000-010100;
ST 2 0000-010100;
FI 2 0000-010100;

Make entries the same as with the Real Time Clock, Para. 9.02. Be sure these times are not set for the near future if an automatically-timed test run(s) is not desired.

This is the first in a series of four (4) prompts that enable the AM1 PLUS to automatically start and finish a test run at preselected times. This feature is useful to conveniently test customer lines at early morning hours during low traffic. Two (2) pre-programmed runs can be made. The first set of two (2) prompts determine the start (STart 1) and finish (FInish 1) times respectively of the first run. The second set of prompts can be used to repeat testing during another pre-selected time interval, starting at the time set for ST 2 and finishing at FI 2. See Para. 14.10,C for sample automatic start and finish printouts.

9.08 WAIT TIME

CALL PARAMETER/DATA DISPLAY

- TIME 03;

Acceptable values: 01 to 50 (seconds)
Recall "0" = 03 seconds

A "WAIT" ("-") can be inserted anywhere in the Dialed Number Field to cause a pause in the sequence. This parameter determines the length of the WAIT. See Para. 10.06 concerning the Dialed Number Field line parameter. See Para. 10.07,A,5 concerning how the "WAIT" is used to program Immediate Dial.

9.09 CUT-THROUGH DELAY TIME

CALL PARAMETER/DATA DISPLAY

CT TIME 02;

Acceptable values: 01 to 25 (seconds)
Recall "0" = 02 seconds

Cut-Through Delay Time is the time the user can program to allow for the switch to establish a path and for transients to die down. It is the time between when the Terminate line answers and the first Voicepath Confirmation Tone is sent.

9.10 POWER-ON TELEPHONE NUMBER RECALL

CALL PARAMETER/DATA DISPLAY

PWR RCL TEL 1;

• See NOTE in Para. 10.15 for explanation of this "W".

Possible entries:
0, 1, 2, 3, or 4, to RECALL the telephone numbers STORED in the respective EPROM or EEPROM memory.
Recall "0" = 0 (blank Dialed Number Fields)

9.10 POWER-ON TELEPHONE NUMBER RECALL, continued

This prompt determines what telephone numbers (entries in the dialed number field) will come up for a "cold start" power up, i.e. when the power is applied with the PWR switch.

NOTE
This prompt does not affect the dialed number field for a power failure or if the power is applied by plugging in the power cord with the PWR switch already ON.

If a "0" is entered in this prompt, the dialed number fields will be blank for a "cold start" power up.

If 1, 2, 3, or 4 is entered in this prompt, the dialed number field entries stored in the respective EEPROM memory (if any have been stored) will come up with a "cold start" power up. Telephone numbers are stored in EEPROM memory using SPECIAL FUNCTION A; see Para. 11.09 for details.

9.11 POWER-ON PARAMETER RECALL

CALL PARAMETER/DATA DISPLAY

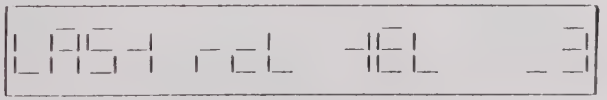
PWR RCL PARAM 0;

Possible entries:
0, 1, 2, 3 or 4 to RECALL the parameters STORED in the respective EPROM or EEPROM memory.
Recall "0" = 0 (Factory-set parameters)

This prompt determines what parameter settings (both unit and line) will come up for a "cold start" power on. It is comparable to the prompt in Para. 9.10 above.

9.12 LAST RECALLED TELEPHONE NUMBERS

CALL PARAMETER/DATA DISPLAY



LAST RCL TEL _3;

Information only. Not a user-entered parameter.

This display records what was the memory location of the last set of telephone numbers recalled. See Para. 11.10 concerning SPECIAL FUNCTION B to RECALL telephone numbers stored in EPROM or EEPROM memory.

9.13 LAST RECALLED PARAMETERS

CALL PARAMETER/DATA DISPLAY

LAST RCL PARAM_2;

Information only. Not a user-entered parameter.

This display records what was the last set of parameters recalled. See Para. 11.10 concerning SPECIAL FUNCTION B to RECALL unit and line parameter values stored in EEPROM memory.

RS232 OPTION 28-0079 ONLY
See Para. 14.02

9.14 RS232 PORT BAUD RATE

CALL PARAMETER/DATA DISPLAY

BAUD 0300;

Possible entries:
300, 1200, 2400, 4800 and 9600 Baud
Recall "0" = 300 Baud

Set the Baud Rate to match the Baud rate of the device connected to the RS232 Port. Use Table 14-1 as a guide in setting the Baud Rate according to the setup.

9.15 RS232 PORT PARITY

CALL PARAMETER/DATA DISPLAY

PARITY ODD=1 0;

Possible entries:
1 = Odd Parity
0 = Even Parity
Recall "0" = 0, Even Parity

Set the Parity to match the Parity of the device connected to the RS232 Port.

9.15A CARRIAGE RETURN DELAY

CALL PARAMETER/DATA DISPLAY

CR DELAY 0000;

Acceptable values: 0000 to 1999 milli-seconds (ms)
Recall "0" = 0000 ms (no delay)

Definition. When the AM1 PLUS is outputing information to the RS232 Port, a Carriage Return command is executed at the end of each line. Carriage Return Delay is an increment of time that is inserted after each Carriage Return, delaying the output of the next line of information to the RS232 Port.

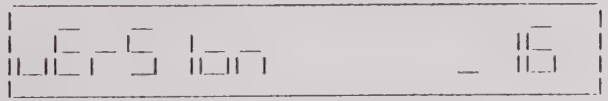
Purpose. This prompt slows down the output of a report through the RS232 Port so as not to load down the printer. This is useful when using printers that have only a small buffer which would otherwise overflow and print out "garbage".

Implementation. A non-zero entry for this prompt is only necessary if the the output device cannot keep up with the output of the AM1 PLUS. The greater the Carriage Return Delay entered, the slower the AM1 PLUS will output information through the RS232 Port. The Carriage Return Delay setting does not affect the Baud rate, however.

When using Carriage Return Delay with AM1 PLUS sets chained together, the CR DELAY must be set the same in each Basic Unit. Remember that AM1-SPA and AM1-SPD units are inherently chained so each Basic Unit within the package must have the same setting for CR DELAY.

9.16 SOFTWARE VERSION

CALL PARAMETER/DATA DISPLAY



VERSION _16 ;

Information only. Not a user-entered parameter.

This display reports what version of software is installed. The last space in the display may be blank; the last space is to allow for a letter ("A", "B", etc.) to distinguish the version.

9.17 UNIT PARAMETER STORE/RECALL

The Unit Parameter settings described in this section can be stored in EEPROM non-volatile memory for future use. Unit parameters previously stored in EEPROM memory can be recalled. See Para. 11.09 and Para. 11.10 for EEPROM store/recall instructions.

Note that store/recall Telephone Number, i.e. the contents of the Dialed Number Field (Para. 10.06), is a Line Parameter function, not a Unit Parameter.

10. SETTING LINE PARAMETERS

Introduction. This section describes how to set the AM1 PLUS Line Parameters in preparation for a test run. Line Parameters are individually set for each of the possible 30 lines that can be controlled by each Basic Unit. In addition to the Line Parameters there are Unit Parameters which are programmed for the AM1 PLUS in general.

NOTE
See Section 9 to set Unit Parameters.

Line Parameters are set by scrolling through the parameter prompts and entering values per the desired application. There are two (2) ways to accomplish this:

A. With the basic unit, by entering the commands with the keyboard and monitoring the prompts and parameter settings on the LED display. See Section 4 for instructions to scroll through prompts and enter values.
B. With a terminal connected to the RS232 port, by entering the commands with the terminal keyboard and viewing the prompts and parameter settings on the screen of the terminal monitor. The RS232 port is an option and must be ordered to be included with the AM1 PLUS unit. See Section 14 for RS232 port operation instructions.

In this section, there is a paragraph dedicated to each line parameter. The parameters are covered in the order in which they appear in the scroll. The following format is used:

A. The title of each paragraph is the name of the parameter.
B. Following the title is an illustration of the LED display for that parameter on the AM1 PLUS basic unit.
C. Under the illustration, the parameter display is shown as it appears on the screen of a terminal monitor connected through the RS232 port.
D. Then the possible entries for the parameter are defined or the range of acceptable values is given, as appropriate. The Recall "0" value is also given; see Para. 11.10 (SPECIAL FUNCTION B).
E. Explanatory and applications notes are then given.

The paragraphs in this section are listed below:

10.01 Line Parameter Select
10.02 Line Enable
10.03 Notes on Assigning Originate and Terminate Ports
10.04 Originate Port Location
10.05 Terminate Port Location
10.06 Dialed Number Field
10.07 Notes on the Dialed Number Field
10.08 Definitions of Dial Tone Delay and Dial Tone Fail
10.09 Dial Tone Delay Threshold
10.10 Dial Tone Fail
10.11 Paired/Unpaired Mode
10.12 Confirmation Tone: Frequency and Direction
10.13 Originate/Terminate Confirmation Tones
10.14 Answer Supervision

Introduction, continued

Paragraphs in this section, continued:

10.15 Terminate Port Delay/Wink Timing
10.16 Originate Port Timeout & Terminate Port Rings Before Answer
10.17 Intercall Time
10.18 Call-to-Call Time
10.19 Dialing Mode
10.20 Tone Dialing Low-Frequency Offset
10.21 Tone Dialing High-Frequency Offset
10.22 Tone Dialing Output Level
10.23 Tone Dialing On/Off Timing
10.24 Dial Pulse Speed and Percent Break
10.25 Dial Pulse Interdigit Delay Time
10.26 Conversation Time
10.27 Start Delay
10.28 Flash Time
10.29 Confirmation Tone Check Tries
10.30 Copying Line Parameters
10.31 Line Parameter Store/Recall
10.32 Line Parameter Printouts

NOTE

This section assumes familiarity with AM1 PLUS parameter entry as described in Para. 4.11. The Line Parameters described in this section are listed in Fig. 4-3 and also in the FOLDOUT at the end of the manual.

10.01 LINE PARAMETER SELECT

CALL PARAMETER/DATA DISPLAY

LINE 01;

Acceptable values: 01 thru 30

Choose Line for which parameters are to be set: "01" thru "30".

This is one of 30 unique locations for specifying and controlling originating and terminating ports.

In order to access the Line Parameters from a Unit Parameter or Special Function display:

A. Press [SEL LINE, A] to bring up the display shown above
B. Enter desired line number (select from "01" thru "30")
C. Press [ETR/STP PARAM, B]

The Line Enable (ON/OFF) display will appear, shown next.

10.02 LINE ENABLE

CALL PARAMETER/DATA DISPLAY

ON=1 OFF=0 1;

Possible entries:
- 0 = Line switch OFF (originate line will not come off-hook)
- 1 = Line switch ON (originate line will come off-hook after a START command)

Recall "0" = 1

This prompt is especially useful when operating the AM1 PLUS by remote control. See Para. 14.14.

In order for this parameter to work, the Line Switch on the front panel of the AM1 PLUS or AM1E unit must be in an ON position (in some units, the switches have more than one ON position). If the line switch is OFF, the line will be OFF regardless of this parameter setting.

This prompt will thus enable the selected line to stay ON as set by the switch on the front panel or to turn the line OFF, even though the front panel switch is in an ON position.

NOTE

Some Line Parameter prompts appear for all applications. Other Line Parameter prompts only appear under certain conditions.

For example, the next two (2) prompts, for Originate Port Location and Terminate Port Location, will only appear if there is an AM1 PLUS-D or AM1T1 used in the Set.

Line Parameter prompts that do not always appear, or are only meaningful for certain applications, are enclosed in a box with a title at the top to indicate the application, as shown below:

NAME OF APPLICATION

Information about Line Parameter prompt enclosed in the box.

Line Parameter prompts that appear for all applications are not labelled in any special way.

FOR T1, DIGITAL UNITS, ONLY

10.03 NOTES ON ASSIGNING ORIGINATE AND TERMINATE PORTS

Para. 10.04 and 10.05 cover parameters that only appear if there is an AM1 PLUS-D or an AM1T1 unit being used in the set. Below is an explanation of why these extra prompts are needed in the case of digital units, and not for analog units.

Analog Lines. When there are only analog lines in the set, for example an AM1 PLUS-1 basic unit connected to an AM1E PLUS-1 expansion unit, each of the 30 line locations in the set has a corresponding analog line; line locations 01 thru 30 are uniquely assigned to analog lines 01 thru 30 respectively. Each originate port and terminate port is thus uniquely assigned: originate port 01 and terminate port 01 are assigned to line location 01, etc. respectively thru line location 30. There is no need, therefore, to have parameter prompts to assign analog originate and terminate ports.

Digital Lines. With digital T1 trunks in the set, however, any of the lines 01 thru 24 from any of the three (3) T1 span lines B,C and D (total of 72 possible lines) can be assigned to any originate or terminate port location (total of 60 locations). However, each digital line can only be assigned to one originate or terminate port location.

A common mistake is to try to assign the same digital line to both the originate and terminate port of the same line location; for example, it is not possible to have originate B-01 and terminate B-01; digital line B-01 can only be used in one originate or terminate port location. The confusion comes from trying to treat the digital nomenclature the same as the analog (for example, originate A-01 and terminate A-01 are the analog line assignments for line location 01). Some example acceptable assignments for digital lines would be originate B-01 and terminate B-02, or originate C-02 and terminate D-03.

It is helpful to make a chart to keep track of line assignments. One method would be to assign only odd lines to originate ports and only even lines to terminate ports as shown in the example below:

LINE	1	2	3	4	5	6	7	8	9	10	11	etc. thru	30
ORIGINATE PORT	B-01	B-03	B-05	B-07	B-09	B-11	B-13	B-15	B-17	B-19	C-01	.....	D-19
TERMINATE PORT	B-02	B-04	B-06	B-08	B-10	B-12	B-14	B-16	B-18	B-20	C-02	.....	D-20

NOTE

See Para. 10.12 and 10.13 for discussion of Voicepath Confirmation Tone activity at each port for both Paired and Unpaired operation.

The purpose of the next two line prompts is to assign the Originate and Terminate Ports.

WITH T1, DIGITAL UNITS, ONLY

10.04 ORIGINATE PORT LOCATION

CALL PARAMETER/DATA DISPLAY

ORIG PORT A-01

Possible entries:
A-01 thru A-30 to assign to an Analog line
B-01 thru B-24 to assign to a "B" T1 span line
C-01 thru C-24 to assign to a "C" T1 span line
D-01 thru D-24 to assign to a "D" T1 span line

Recall "0" = A-01 thru A-30 for lines 01 thru 30

The Originate Port Location parameter appears only if there is an AM1 PLUS-D or an AM1T1 being used in the set. See notes in Para. 10.03.

This parameter identifies the location of the originate port. "A-01" indicates that the call for this memory location will be originated from the Analog originate port designated as "01". If a T1 port is desired, the entry should changed to read the appropriate span line (B, C, or D) and any of the digits 01 thru 24.

10.05 TERMINATE PORT LOCATION

CALL PARAMETER/DATA DISPLAY

TERM PORT A-01

Possible entries:
A-01 thru A-30 to assign to an Analog line
B-01 thru B-24 to assign to a "B" T1 span line
C-01 thru C-24 to assign to a "C" T1 span line
D-01 thru D-24 to assign to a "D" T1 span line

Recall "0" = A-01 thru A-30 for lines 01 thru 30

The Terminate Port Location parameter appears only if there is an AM1 PLUS-D or a AM1T1 being used in the set. See notes in Para. 10.03. This parameter is equivalent to the Originate Port Location parameter in Para. 10.04.

10.06 DIALED NUMBER FIELD

CALL PARAMETER/DATA DISPLAY

1st field	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016
2nd field	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032
3rd field	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048
4th field	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063	064
5th field	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080
6th field	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096
7th field	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111	112
8th field	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128

Recall "0" = Blank Field

The Originate Port dialed number is entered in this blank field on the display. There are up to eight (8) available 16-digit blank fields, for a possible total of 128 digits. The possible entries into this Dialed Number Field not only command the Originate Port to outpulse digits (dial a number), but also to execute a number of other commands. See the "Possible Entries" lists below. See Para. 10.07 for notes about the digits entered into the Dialed Number Field. For the purpose of store/recall, the contents of the Dialed Number Field is referred to as the "Telephone Number"; see Para. 11.09 and 11.10.

Multiple Dialed Number Fields ("Extended Digit Dialing"). If more than 16 digits are desired in the Dialed Number Field, enter the first 16 digits, then press [ETR/STP PARAM,B] to display the 2nd blank field. Repeat for the 3rd up to 8th fields as required, filling each field with 16 digits and then pressing [ETR/STP PARAM,B] to access the next field. When [ETR/STP PARAM,B] is pressed with the Dialed Number Field not filled with digits (if 16th digit in that field is blank), the next display to appear will be the Dial Tone Delay Threshold prompt of Para. 10.09. See Para. 15.11 for EXAMPLE with two (2) Dialed Number Fields.

Possible Entries (Digits) that are Primary Functions (black on the AM1 PLUS keyboard):

Any of the digits 0 thru 9, * (KP) and # (ST). See Para. 10.07,B note concerning KP and ST digits used in MF and DMF dial modes.

Possible Entries (Digits) that are Secondary or Multiple Secondary Functions (red on the AM1 PLUS keyboard):

DIGIT	FUNCTION
A	Digit A (DTMF or MF) or, if used as first digit of Dialed Number Field for a T1 port, emulates FXO Ground Start signaling. See Para. 15.06. "A" is not outpulsed when it is the first digit.

10.06 DIALED NUMBER FIELD, continued

Possible Entries (Digits) that are Secondary or Multiple Secondary Functions (red on the AM1 PLUS keyboard), continued:

DIGIT(S)	FUNCTION
B	Digit B (DTMF or MF)
C	Digit C (DTMF or MF)
D	Digit D (DTMF) or, if used as first dialed digit of T1 Originate Port, will cause that port to Delay start dial until the "M" lead drops (goes to ground). "D" is not outpulsed when it is the first digit.
E (ESC)	Commands a temporary ESCAPE from the dialed number to look for Confirmation Tone as programmed by the CONF TONE parameter (**Paired Mode**), Para. 10.12, or O-T TONE parameter (**Unpaired Mode**), Para. 10.13.
EE (ESC, ESC)	Stop dialing and wait for 1000 Hz tone (milliWatt).
EA (ESC, A)	Stop dialing and unbalance the line by placing a ground on the Ring connection for 500ms.
EB (ESC, B)	Toggle to next Dialing Mode. The Dialing Mode sequence for the toggle is listed below: 1 = Touch Tone (TT*), by common tone generator 2 = Dial Pulse (DP) 3 = Multi-Frequency (MF) 4 = Touch Tone (TT*), using tone generator on line card for AM1 PLUS-1 and AM1E PLUS-1 or 4 = Digital Multi-Frequency (DMF), with AM1 PLUS-D or AM1T1 units. *Touch Tone (TT) is also called DTMF dialing. NOTE: The Dialing Mode prompt, Para. 10.19, does not indicate mode "4" dialing, but it is still part of the toggle sequence.
EC (ESC, C)	Stop dialing and wait for a WINK of 100 ms minimum duration. See Para. 15.05 for use of wink for Direct Inward Dialing (D.I.D.) testing.
F (FLASH)	Generate programmable hook FLASH (momentary on-hook), the duration of which is set with the "FLASH TIME" prompt; see Para. 10.28.
(BLANK)	Dialing is terminated at the first BLANK in the Telephone Number. If any digits were entered after the BLANK, they would not be output. If a break is desired in the dialed number sequence, enter a "-", WAIT, in the Dialed Number Field. The length of a call can be increased using Conversation Time; see Para. 10.26. Appears as blank space in Dialed Number Field.

10.06 DIALED NUMBER FIELD, continued

Possible Entries (Digits) that are Secondary or Multiple Secondary Functions (red on the AM1 PLUS keyboard), continued:

DIGIT	FUNCTION
- NEG (-)	Programmable WAIT (01 to 50 seconds) in dialing and, if used as first digit, will also override the initial automatic pause-for-Dial-Tone or pause-for-WINK. When used as first digit, outpulsing will start after the WAIT time; no Start Dial signal is required; this is referred to as "Immediate" start dial; see Para. 10.07.A.5. See Para. 9.08 for Unit Parameter to program WAIT time.
	NOTE This is not the familiar "-" used in writing a telephone number, e.g. 915-5441; this would be entered as 9155441 in the Dialed Number Field.
P (PAUSE)	Pause-for-Dial-Tone, wherever this is inserted in the Dialed Number sequence. There is an automatic Pause-for-Dial-Tone before theDialed Number Field of an Analog Originate Port (therefore no need to have a "P" as first digit for this case). For T1 Originate Ports, however, since the automatic Start Dial Signal is a WINK, if the T1 Originate Port is Dial Tone start, enter a "P" as the first digit.

10.07 NOTES ON THE DIALED NUMBER FIELD

A. Start Dial Signals

1. **Analog Loop Originate Port.** There is an automatic pause-for-dial-tone before the first digit in the Dialed Number Field. Normally, dial tone must be received at the Originate Port before dialed digits are outpulsed; see note 5 below for exception to this. It is only necessary to enter a "P", PAUSE-for-dial-tone, if dial tone is expected between dialed digits, for example after dialing a "9" to access an outside line from a PBX. To change the automatic pause-for-dial-tone start signal, a pause for WINK, "EC", can be entered as the first digits, e.g. for D.I.D. (Direct Inward Dialing); see Para. 15.05.

2. **Analog Ground Start Originate Port.** The AM1 PLUS supplies a ground on the Ring and then waits for Dial Tone as the Start Dial Signal.

3. **Digital, T1, Originate Port.** There is an automatic pause-for-wink before the first digit in the dialed number field. Normally, a WINK of $\geq$ 100ms and $\leq$ 1500ms is required before the dialed digits are outpulsed; see note 5 below for exception to this. If an initial WINK

10.07 NOTES ON THE DIALED NUMBER FIELD, continued

A. Start Dial Signals, continued

3. **Digital, T1, Originate Port**, continued.

is in excess of 1500 ms, the port will begin outpulsing the dialed digits after 1500 ms, without waiting for the end of the WINK. If desired, the automatic initial pause-for-wink can be changed to a different start-dial signal by entering either a "P" (PAUSE for dial tone) or a "D" (delay dial) as the first digit in the dialed number field. See Para. 15.06 concerning emulation of FXO Ground Start signaling (using "A" as first digit).

NOTE

The use of the "D" as the first digit to be compatible with delay dial circuits applies to T1 Originate Ports only.

4. **Analog, E&M, Originate Port.** When an analog "E&M" port is programmed as the originate port, set the Start Signal DIP switches (2 lower DIP switches as shown in Fig. 6-3 and Fig. 8-5) to the type of start signal expected (dial tone, wink, immediate or delayed). Dialed digits entered into the Dialed Number Field will be outpulsed only after the expected start signal is received.

5. **"Immediate" Dial.** Enter a WAIT, "-", as the first digit in the dialed number field and the originate port will "immediately" outpulse digits without waiting for a Start Dial signal. There will be a delay between seizure (off-hook) and the outpulsing of the digits equal to the length of the WAIT, as programmed by the Wait Time unit parameter (see Para. 9.08).

B. MF or DMF Dialing

1. When outpulsing MF or DMF (digital MF), it is usually a network requirement to have a KP digit before the dialed number; also, depending on the application, it may be necessary to have an ST digit after the dialed number.

2. Enter a "*" for the KP digit and "#" for the ST digit. Some switches will also recognize MF digits "A", "B" or "C" as an ST digit; see the chart below.

NAME	KEY	MF TONE PAIRS (Hz)
KP	*	1100/1700
ST	#	1500/1700
ST3P	A	700/1700
STP	B	900/1700
ST2P	C	1300/1700

NOTE

A KP digit is not a network requirement to dial DTMF (Touch Tone) or DP (Dial Pulse) digits.

3. The KP tone ON time will be twice the programmed ON time for that line. See Para. 10.23 for ON/OFF Time line parameter prompt.

10.07 NOTES ON THE DIALED NUMBER FIELD, continued

B. MF or DMF Dialing, continued

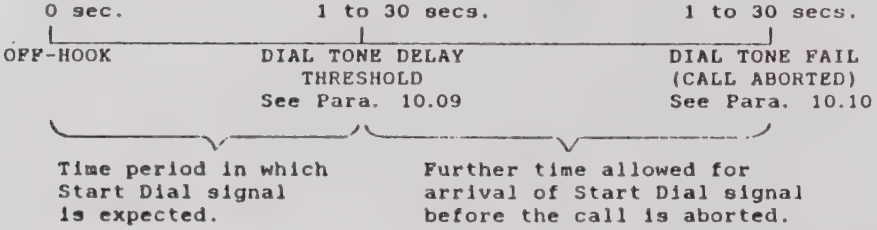
4. On the display, the "*" digit appears as "[" and the "#" digit appears as "]", indicating open and close square brackets on either side of the MF or DMF dialed number.

C. Digit Pointers for Real Time Error Report

The 3-digit numbers, 001 thru 128, shown under the display in Para. 10.06, indicate the positions of the digits in the Dialed Number Fields. These position identifications are used in the Real Time Error Report printout as "Digit Pointers" to indicate where an error occured. See Para. 14.08 and Fig. 14-6.

10.08 DEFINITIONS OF DIAL TONE DELAY AND DIAL TONE FAIL

To understand the parameter settings in the next two paragraphs (Para. 10.09 and 10.10) it is necessary to understand what is meant by the Dial Tone Delay threshold and Dial Tone Fail. These parameters can be illustrated on a time line as shown below:


0 sec.
1 to 30 secs.
1 to 30 secs.
OFF-HOOK
DIAL TONE DELAY THRESHOLD
See Para. 10.09
DIAL TONE FAIL (CALL ABORTED)
See Para. 10.10
Time period in which Start Dial signal is expected.
Further time allowed for arrival of Start Dial signal before the call is aborted.

Dial Tone Delay and Dial Tone Fail are both variable parameters that can be set in the range 01 to 30 seconds.

Dial Tone Fail. If the Start Dial signal (Dial Tone, Wink, or end of Delay) arrives any time up to the Dial Tone Fail time, the AM1 PLUS will start outpulsing the digits entered into the Dialed Number Field (Para. 10.06). If the Start Dial signal arrives after the time set for Dial Tone Fail, the AM1 PLUS will abort the call (go back on-hook). If the call is aborted, the No Dial Tones Data Register will increment; see Para. 13.11. The Dial Tone Delays Data Register will also increment; see Para. 13.10. If Real Time Error Reports are enabled (Para. 9.06), the report for Dial Tone Fail is "NO DIAL TONE"; see 2) in Fig. 14-6.

Dial Tone Delay. This is the allowable time (seconds) from off-hook, within which the Start Dial signal is expected; if the Start Dial signal arrives after this time, it is considered to be late ("slow dial tone"). There is a Dial Tone Delays Data Register which increments during a test run if the Start Dial signal is received after the time set in this parameter, or if the Start Dial signal is not received at all; see Para. 13.10. If Real Time Error Reports are enabled (Para. 9.06), the report for Dial Tone Delay is "SLOW DIAL TONE"; see 1) in Fig. 14-6.

10.09 DIAL TONE DELAY THRESHOLD

CALL PARAMETER/DATA DISPLAY

DT DELAY 03;

Acceptable values: 01 to 30 seconds

Recall "0" = 03 seconds

See Para. 10.08 for the meaning of Dial Tone Delay Threshold. Another name for this parameter is "Slow Dial Tone Threshold". Note that this parameter has no meaning when a WAIT ("-"), "Immediate" Dial is programmed as the first digit. See Para. 10.07,A,5.

The Dial Tone Delays Data Register (Para. 13.10) will only increment once per call, even if more than one Start Dial signal is late within the same call.

If Real Time Error Reports are enabled (Para. 9.06), the report for Dial Tone Delay is "SLOW DIAL TONE"; see 1) in Fig. 14-6.

10.10 DIAL TONE FAIL

CALL PARAMETER/DATA DISPLAY

DT FAIL 15;

Acceptable values = 01 to 30 seconds

Recall "0" = 15 seconds

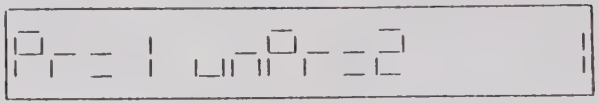
See Para. 10.08 for the meaning of Dial Tone Fail. Note that this parameter has no meaning when a WAIT ("-"), "Immediate" Dial is programmed as the first digit. See Para. 10.07,A,5.

The No Dial Tones Data Register (Para. 13.11) will increment during a test run if the Start Dial signal is not received within the time set for this parameter (at which time the call is aborted).

If Real Time Error Reports are enabled (Para. 9.06), the report for Dial Tone Fail is "NO DIAL TONE"; see 2) in Fig. 14-6.

10.11 PAIRED/UNPAIRED MODE

CALL PARAMETER/DATA DISPLAY



PR=1 UNPR=2 1;

Possible entries:
1 = PaiRed mode of operation
2 = UNPaiRed mode of operation
Recall "0" = 1

A. Paired Mode

The dialed number outpulsed from an Originate port will cause the call to be directed to a specific Terminate port of the same AM1 PLUS set.

For analog paired operation, the originate port must always call the terminate port on the same line; line 01 originate port must call line 01 terminate port, etc.

For digital paired operation, a call from the Originate Port Location programmed in Para. 10.04 must terminate in the Terminate Port Location programmed in Para. 10.05.

B. Unpaired Mode

The key fact for unpaired operation is that Originate and Terminate ports are totally independent.

With respect to an Originate Port, the dialed number outpulsed will cause the call to be directed to any of a number of Terminate Ports, not necessarily a port of the same AM1 PLUS set. Also, calls can be directed to points outside of an AM1 PLUS, for example to milliWatt sources.

With respect to a Terminate Port, for analog unpaired operation, the call does not necessarily originate from the corresponding Originate Port on the same line. With digital unpaired operation, the call does not necessarily originate from the programmed Originate Port Location (Para. 10.04). The programmed Terminate Port Location (Para. 10.05) is only a possible terminate location for calls originated someplace. In general, the call does not even necessarily originate from the same AM1 PLUS unit.

The next two paragraphs concern Voicepath Confirmation Tones: the Para. 10.12 prompt only appears for Paired Mode and the Para. 10.13 prompt only appears for Unpaired Mode. See Para. 15.07, 15.08 and 15.09 concerning Voicepath Confirmation Tones in different Unpaired Mode setups with both Digital and Analog units.

PAIRED MODE ONLY

10.12 CONFIRMATION TONE: FREQUENCY AND DIRECTION

CALL PARAMETER/DATA DISPLAY

CONF TONE 12;

First Digit (Frequency) — Second Digit (One-way or Two-way)

Possible entries:

First Digit: select a number from 1 thru 8, per list below, to assign the Confirmation Tone frequency,

1 = 697 Hz
2 = 770 Hz
3 = 852 Hz
4 = 941 Hz
5 = 1209 Hz
6 = 1336 Hz
7 = 1477 Hz
8 = 1633 Hz

Second Digit: 1 = one-way voicepath confirmation, from Terminate Port to Originate Port only.
2 = two-way voicepath confirmation, from Terminate Port to Originate Port and then from Originate Port to Terminate Port.

Recall "0" = 12
(697 Hz for the Confirmation Tone with 2-way voicepath confirmation)

This parameter appears only if Paired Mode operation is selected (see Para. 10.11).

The first digit indicates which of the eight (8) tones listed above is used for making the voicepath confirmation check for this pair of ports. The second digit indicates whether the voicepath check is to be one-way or two-way.

The sequence (see Table 13-1 for complete call sequence):
1. Terminate Port Off-Hook (Ring Trip)
2. Cut-Through Delay (see Para. 9.09)
3. Confirmation Tone sent from Terminate to Originate Port.
4. Confirmation Tone sent from Originate to Terminate Port (two-way confirmation only)

PAIRED MODE ONLY

10.12 CONFIRMATION TONE: FREQUENCY AND DIRECTION, continued

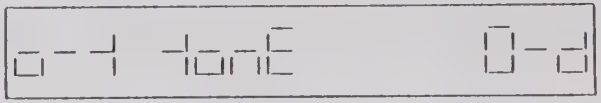
NOTE

When a Conversation Time is programmed, voicepath confirmation is done twice, once before the Conversation Time and again just before the end of the Conversation Time; see Para. 10.26.

UNPAIRED MODE ONLY

10.13 ORIGINATE/TERMINATE CONFIRMATION TONES

CALL PARAMETER/DATA DISPLAY



O-T TONE O-D;

First Digit (Tone Expected by Originate Port)

Second Digit (Tone Generated by Terminate Port)

Possible entries:

First Digit: select a digit from 0 thru 9 or A thru D, per the list below, to assign the Confirmation Tone frequency Expected by the Originate Port programmed for this line:

0 = 1025 Hz
1 = 1150 Hz
2 = 1275 Hz
3 = 1400 Hz
4 = 1525 Hz
5 = 1650 Hz
6 = 1775 Hz
7 = 1900 Hz
8 = 2025 Hz
9 = 2150 Hz
A = 2275 Hz
B = 2400 Hz
C = 900 Hz
D = QUIET (Don't care)

Second Digit: select a digit from 0 thru 9 or A thru D, per the list above, to assign the Confirmation Tone frequency Generated (sent) by the Terminate Port programmed for this line.

Recall "0" = 0-D

UNPAIRED MODE ONLY

10.13 ORIGINATE/TERMINATE CONFIRMATION TONES, continued

This parameter appears only if Unpaired Mode operation is selected for this line (see Para. 10.11). This prompt is generally only used for digital T1 units with the Originate and Terminate ports assigned per Para. 10.04 and Para. 10.05.

Settings are made to determine the frequencies used in making voicepath confirmation checks between the originate and terminate ports. **When operating in the Unpaired mode, with a T1 digital unit, only one-way voicepath checks can be made**; see Para. 15.07.

The first digit of the prompt determines the frequency of the tone expected by the Originate Port programmed for this line. Use "0" as the first digit when terminating to a 1000 Hz (milliWatt) source in the Unpaired mode.

The second digit of the prompt determines the frequency of the tone generated (sent) by the Terminate Port programmed for this line.

By selecting the same second digit, assign the same frequency to all the Terminate Ports in the same trunk group. With the first digit, match the frequency expected by the Originate Port to the frequency sent by the Terminate Ports in the trunk group to which the call is directed; see EXAMPLE in Para. 15.07. Since there are 13 different frequencies available (0 thru 9 and A thru C), there can be up to 13 trunk groups per AM1 PLUS.

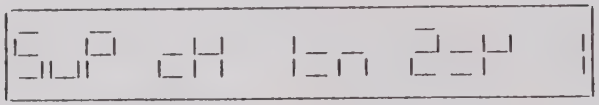
S.I.T. (Special Information Tones). In some switch installations, an incompleted call will cause the originated call to be routed to a recording. Associated with some of these recordings are a series of tones called Special Information Tones (S.I.T.). The frequencies used for these tones may be any of the following: 913.8 Hz, 985.2 Hz, 1370.6 Hz, 1428.5 Hz, 1776.7 Hz. These S.I.T. tones could cause the call to appear completed (i.e. confirming tone received). Therefore, in these environments, do not use the digits 0, 3, 6, or C in this prompt.

In addition to the confirmation tones, there is a special digit, "D", which indicates No Voicepath Confirmation Check.

Analog Unpaired Modes. It is an unusual application in Unpaired mode to have an Analog, loop Terminate Port. If the Terminate Port must be Analog, however, there are two (2) possible types of Unpaired Analog operation, as discussed in detail in Para. 15.08 and 15.09. Two-way voice path confirmation is possible with SPECIAL FUNCTION 0 (Para. 15.08), whereas no voicepath confirmation can be made when operating in Analog Unpaired mode without SPECIAL FUNCTION 0 (Para. 15.09); for this case, select "D" (Quiet termination) for both the first and second digits of this prompt.

10.14 ANSWER SUPERVISION CHECK

CALL PARAMETER/DATA DISPLAY



SUP CH 1=N 2=Y 1;

Possible entries:
1 = No. Answer SUPervision not expected by the Originate Port.
2 = Yes. Answer SUPervision is expected by the Originate Port.

"M" Lead Answer Supervision. This is a continuous polarity reversal (reverse battery) applied by a PBX or Central Office switch to the originate line when the called party answers. Answer Supervision is present for the duration of the call and is used for billing purposes. Note that a Wink is also a reverse battery signal applied to the originate line, but a Wink is a momentary reversal of polarity whereas Answer Supervision is a continuous polarity reversal.
The setting of this parameter is used as part of the criteria for a completed call to be scored. If this parameter is set to 2 (Yes), the check for Answer Supervision is made at the start of each voicepath confirmation tone check and just before disconnect (a total of 5 checks if Conversation Time is programmed); Answer Supervision is considered to be present if it is sensed at any of the checks. If this parameter is set to 1 (No), it does not matter if Answer Supervision is present or not. See Fig. 14-6 item 12) for sample No Answer Supervision Real Time Error Report.

WITH T1, E&M, OR UNPAIRED OPERATION ONLY

10.15 TERMINATE PORT DELAY/WINK TIMING

CALL PARAMETER/DATA DISPLAY

1 D-W 00000-0000;

Possible entries:
Delay Time (5-digit field) = 00000 thru 99900 msec, in 100 millisecond steps
Wink Time (4-digit field) = 0000 thru 6250 msec, in 50 millisecond steps
"0000" = Terminate Port Answer after Delay Time

Typical Setting: 00300-0200 (300 ms Delay, 200 ms Wink)
Recall "0" = 00000-0000

WITH T1, E&M, OR UNPAIRED OPERATION ONLY

10.15 TERMINATE PORT DELAY/WINK TIMING, continued

NOTE

Explanation of the representation for "W" in the LED display: the name for the letter "W" is "double U", which is written as two "U"s side-by-side. In the case of the LED display, the two "U"s are written one on top of the other, giving the appearance of an upside down "A".

This parameter appears for any of the following cases:
- -programmed Terminate Port (Para. 10.05) is T1
- -programmed Terminate Port is E&M
- -Unpaired Mode (see Para. 15.07 & 15.09), except Analog 2-way Unpaired Mode, Type 8 (see Para. 15.08)

The purpose of this parameter is to program Delays and Winks sent from the Terminate Port, starting from the time it is seized. Multiple Delays and Winks are used to allow time for the switch under test to outpulse digits such as ANI (Automatic Number Identification), called number, etc.

There are a total of five (5) possible Delay/Wink parameter prompts for each line. Delay/Wink prompts will keep coming up if a Wink time other than 0000 ms is programmed in the previous prompt. A Wink setting of 0000 results in the Terminate Port Answering after the programmed Delay Time.

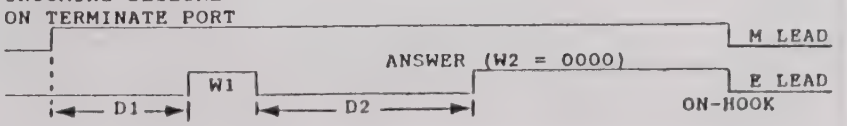
Delay Time. This set of five (5) digits indicate the amount of time, in milliseconds, from seizure on the Terminate Port to Wink or Answer.

Wink Time. This set of four (4) digits indicate the duration of the Wink, in milliseconds. The Wink occurs after the Delay Time.

First Prompt. The Delay Time (D1) is normally set to approximately 300 ms and the Wink Time (W1) to 200 ms.

2 D-W 00000-0000;

Second Prompt. This prompt (above) appears only if a Wink Time other than 0000 is set in the first prompt. It functions the same as the first Delay/Wink prompt. The Delay Time (D2) for this prompt is normally set to 1500 ms and the Wink Time (W2) to 0000, resulting in Terminate Port Answer and no more Delay/Wink prompts appearing. A typical timing diagram is shown below:



WITH T1, E&M, OR UNPAIRED OPERATION ONLY

10.15 TERMINATE PORT DELAY/WINK TIMING, continued

Minimum Settings. Even though a Wink may be set as short as 50 ms, the minimum duration should be 150 ms. The minimum setting for D1 should be 300 ms. All Delay Times are accurate to ±100 ms and Wink Times are ±50 ms.

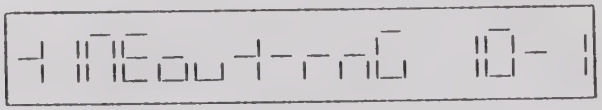
Timing. If a Delay Time, D2, is programmed that is not long enough to allow the switch time to outpulse its digits (for example, ANI), invalid test results may occur. D2 must be at least 1.5 sec. (1500 ms) with digital MF or at 3 sec. (3000 ms) with MF to allow enough time for the switch to outpulse seven (7) digits; do not connect to a switch that would send dial pulses (DP) to the AM1 PLUS Terminate Port. If D2 is not of sufficient duration for the digits to be outpulsed, the switch will probably consider the call to be a failure and not set up the path. On the other hand, if the Wink Time, W1, is not long enough, or too long, the switch will also probably consider the call to be a failure and abort. For these reasons, care should be taken in selecting the timing.

The next prompts will appear, in order, if the Wink Time in each previous Delay/Wink prompt is set to other than 0000.

3 D-W 00000-0000;
4 D-W 00000-0000;
5 D-W 00000-0000;

10.16 ORIGINATE PORT TIMEOUT & TERMINATE PORT RINGS BEFORE ANSWER

CALL PARAMETER/DATA DISPLAY



TIMEOUT-RNG 10-1;

Acceptable values:

Originate Port Timeout: 01 thru 50 seconds, in 01 second steps

Terminate Port Rings Before Answer: 1 thru 8 rings, in 1 ring steps

Recall "0" = 10-1

Originate Port Timeout. This is the amount of time, from the last digit dialed, that the Originate Port will wait before aborting the call. During this time, one of the two conditions listed below must be met for the call to continue:

A. For Paired Mode, a Ring or Seizure (for E&M or T1) must be detected on the Terminate Port or
B. For Unpaired Mode, the programmed voicepath Confirmation Tone must be received (at the Originate Port).

10.16 ORIGINATE PORT TIMEOUT & TERMINATE PORT RINGS BEFORE ANSWER, continued

Originate Port Timeout, continued. This setting should be long enough to always give the switch sufficient time to complete the call, but not so long that time is wasted on calls that will never terminate (re-order, busy, high-and-dry, etc.).

If "D" (Don't care) is programmed for the Originate Port Confirmation Tone (see Para. 10.13), the Originate Port Timeout is ignored; the Confirmation Tone check is made immediately after outpulsing, and then the connection is dropped, unless a Conversation Time (see Para. 10.26) is programmed.

Terminate Port Rings Before Answer. This parameter detemines how many Rings must be received by a Loop, Analog Terminate Port before it will answer the incoming call. This parameter is ignored on E&M and T1 Terminate Ports.

10.17 INTERCALL TIME

CALL PARAMETER/DATA DISPLAY

INTERCALL 03;

Acceptable values: 01 to 25 seconds, in 01 second steps

Recall "0" = 03 seconds

This parameter indicates the amount of time, in seconds, that the Originate Port will stay on-hook, after completing its programmed sequence, before going off-hook and beginning the next sequence. If a Start Delay is programmed with Synchronous Mode, the off-hook of the next call with be further delayed by the Start Delay.

The Originate Port will continue to stay on-hook after completion of the Intercall Time, however, if the Call-to-Call Time has not expired. See illustration in Para. 10.18 for relationship between Intercall Time and Call-to-Call Time.

If this Intercall Time is set too low, the on-hook/off-hook (going on-hook after one call, and then going off-hook to begin the next call) could be interpreted by the switch as a Hook Flash. Therefore, the Intercall Time should not be set to "01" second for 3-way calling lines because the Hook Flash time in all switches is from 0.4 to 1.55 seconds.

For line-to-trunk calls, verify trunk timeouts in the switch; if trunk timeout is greater than two (2) seconds, an Intercall Time of "02" seconds cannot be used. If the Intercall Time is set less than the trunk timeout, the call will go to 120 IPM (reorder), and the AM1 PLUS interprets 120 IPM as dial tone.

USE FOR RANDOM MODE ONLY

10.18 CALL-TO-CALL TIME

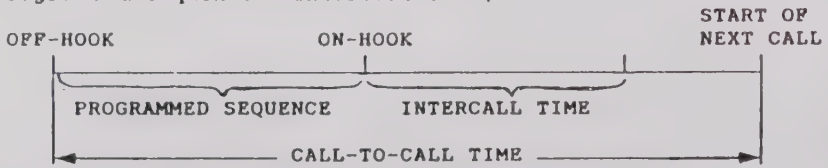
CALL PARAMETER/DATA DISPLAY

CALL-CALL 0000;

Acceptable values: 0000 thru 0255 sec, in 1 sec steps
0260 thru 1275 sec, in 5 sec steps
Recall "0" = 0000 (set to 0000 for Synchronous Mode)

The Call-to-Call Time is the time from the Initial Off-Hook of one call until the Start of the next call. This parameter is used to set a specific call rate (calls per hour). By setting the exact time from one call to the next, one can determine the call volume. This parameter is not meaningful in Synchronous Mode, however, because the timing of the start of each call is determined by the one line that is the slowest (last line to finish its call). Without this parameter, it would be hard to try to set the length of a call by adjusting other parameters because of the difficulty in determining the exact time taken by each step in the sequence.

Call-to-Call Time must be more than the total time for the Programmed Sequence + Intercall Time, as shown below:



Operation. There is a Call-to-Call timer which starts at the initial off-hook of a call. At the end of the Intercall Time, the Call-to-Call timer is checked. If the Call-to-Call Time has not expired by the end of the Intercall Time, the Originate Port will continue to stay on-hook until the Call-to-Call Time expires. If the Call-to-Call Time has expired by the end of the Intercall Time, the next call will start at the end of the Intercall Time.
NOTE: The next call will begin at the end of the Call-to-Call Time or the Intercall Time, whichever time expires last.

EXAMPLE: The Programmed Sequence of a call takes 10 seconds and the Intercall Time is 5 seconds. Call-to-Call Time is 25 seconds. Programmed Sequence + Intercall Time = 15 seconds. Since the Call-to-Call Time is longer, the next call will not start until the end of the 25 second Call-to-Call Time.
For each line: 3600 sec/hr ÷ 25 sec/call = 144 calls/hr.
For 30 lines: 144 calls/hr/line x 30 lines = 4320 calls/hr.

10.19 DIALING MODE

CALL PARAMETER/DATA DISPLAY

TT=1 DP=2 MF=3 4;

Possible entries:
- 1 = Touch Tone (TT*), using shared tone generator
- 2 = Dial Pulse (DP)
- 3 = Multi-Frequency (MF)
- 4 = Touch Tone (TT*), using tone generator on line card, for AM1 PLUS-1 and AM1E PLUS-1 units

or

- 4 = Digital Multi-Frequency (DMF), with AM1 PLUS-D or AM1T1 units.

*Touch Tone (TT) is also called DTMF dialing.

Recall "0" = 4 for AM1 PLUS-1 and AM1E PLUS-1 units
Recall "0" = 1 for all other units

NOTES

-Due to space limitation on the display, the prompt does not indicate mode "4" dialing.
-Lines with E&M Originate Ports have dialing modes "1", "2" and "3" only.
-AM1XT units with Loop/Ground Start Originate Ports, without line-card tone generators, have dialing modes "1", "2" and "3" only.

This parameter sets the mode with which digits are outpulsed by the Originate Port when dialing begins. The Dialing Mode can be changed during the course of a call by entering an "EB", toggle to next Dialing Mode, in the Dialed Number Field; see Para. 10.06.

Touch Tone (TT) Dialing (DTMF)

Dialing Mode "4": Line-Card Tone Generators. AM1 PLUS-1 and AM1E PLUS-1 units have a Touch Tone generator on each line card. Each line can independently generate Touch Tone digits, resulting in a much larger call volume compared to outpulsing Touch Tone digits using the shared tone generator. The disadvantage of this mode is that the frequencies of the dual tones cannot be offset (see Para. 10.20 and 10.21) and the output level of the tones cannot be varied (see Para. 10.22). The dual tones are fixed at center frequencies and nominal outputs of -9 dBm Low Band and -6 dBm High Band. The ON/OFF time, however, can be varied (see Para. 10.23).

Dialing Mode "1": Shared Tone Generator. The frequencies, levels and ON/OFF times of the Touch Tone digits can be varied with the prompts in Para. 10.20 thru 10.23. Dialing is slowed down, however, with all lines sharing one generator. The maximum call rate for an AM1 PLUS in this mode is 4545 calls per hour with minimum duration calls.

10.19 DIALING MODE, continued

Multi-Frequency (MF) Dialing

Dialing Mode "4": Digital MF. This mode is possible only in AM1 PLUS-D and AM1T1 units. Digital MF allows all ports to outpulse digits at the same time which greatly speeds up the call rate compared to analog MF, in which only one port at a time can outpulse an MF digit. The disadvantage of this mode is that the frequencies of the dual tones cannot be offset (see Para. 10.20 and 10.21) and the output level of the tones cannot be varied (see Para. 10.22). The dual tones are fixed at center frequencies and -7 dBm output. The ON/OFF time, however, can be varied (see Para. 10.23).

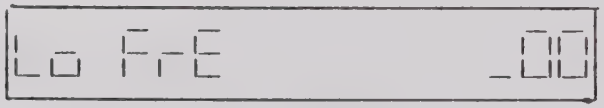
Dialing Mode "3": Analog MF. The frequencies, levels and ON/OFF times of the MF digits can be varied with the prompts in Para. 10.20 thru 10.23. The disadvantage of this mode is that dialing is slowed down with all lines sharing one generator.

Dialing Mode "2": Dial Pulse (DP). The dial pulse speed, percentage of break and interdigital timing can be varied with the prompts in Para. 10.24 and 10.25. When the shared tone generator is being used for tone dialing, DP dialing can be used for some lines to ease the demand on the shared tone generator (a tone generator is not used for DP dialing).

FOR TONE DIALING, MODES 1 and 3 ONLY

10.20 TONE DIALING LOW-FREQUENCY OFFSET

CALL PARAMETER/DATA DISPLAY



LO FRE _00;

Acceptable values: -35 thru 35, in steps of 05
(-3.5% thru +3.5% offset from nominal center frequency in steps of 0.5%)

Recall "0" = _00, leaving Low Frequencies at nominal

NOTE

A positive or negative offset must be selected in the first cursor position. A negative is indicated with a "-" and a positive by a blank space. To enter a negative (-), press [SHIFT,D][NEG (-)]. For a positive, press [SHIFT,D][BLANK].

This parameter only appears if either Touch Tone (TT) Dialing Mode "1" or MF Dialing Mode "3" is selected in Para. 10.19. Tone Dialing Low-Frequency Offset varies the Low Band frequencies of the dual-tone dialing signals. The setting offsets all the Low Frequencies by the same percentage from nominal (from -3.5% to +3.5%).

FOR TONE DIALING, MODES 1 and 3 ONLY

10.21 TONE DIALING HIGH-FREQUENCY OFFSET

CALL PARAMETER/DATA DISPLAY

HI FRE _00;

Acceptable values: -35 thru 35, in steps of 05
(-3.5% thru +3.5% offset from nominal center frequency in steps of 0.5%)

Recall "0" = _00, leaving High Frequencies at nominal

This prompt varies the High Band frequencies of the dual-tone dialing signals. It is comparable to Tone Dialing Low-Frequency Offset; refer to Para. 10.20.

10.22 TONE DIALING OUTPUT LEVEL

CALL PARAMETER/DATA DISPLAY

LO HI DB :06:06;

Low Band Tone Level — High Band Tone Level

Acceptable values:
Low Band Tone Level: 06 thru 30, in 03 dBm steps (range is -6 dBm to -30 dBm)

High Band Tone Level: 06 thru 30, in 03 dBm steps (range is -6 dBm to -30 dBm)

Recall "0" = -06-06 (-6 dBm for both Low and High Band Tone Levels)

This parameter only appears if either Touch Tone (TT) Dialing Mode "1" or MF Dialing Mode "3" is selected in Para. 10.19.

Tone Dialing Output Level sets the output Level of both the Low Band and the High Band Tones. The first two digits set the Low Band Level and the second two digits set the High Band Level. The Twist (difference between the High Band Level and Low Band Level) can be varied with this parameter.

FOR TONE DIALING ONLY

10.23 TONE DIALING ON/OFF TIMING

CALL PARAMETER/DATA DISPLAY

ON-OFF TIM 60-60;

Tone ON Duration — Tone OFF Duration

Acceptable values:
Tone ON Duration: 25 thru 99, in 01 ms steps
Tone OFF Duration: 25 thru 99, in 01 ms steps

Recall"0" = 60-60 (60 ms ON, then 60 ms OFF)

This parameter appears if a tone Dialing Mode is selected in Para. 10.19. It will not appear if DP dialing is selected.

This parameter sets the ON and OFF tone duration of the TT (DTMF), MF or DMF digits. The first two digits of the prompt set the ON time, and the second two digits of the prompt set the OFF, or interdigital, time. Units are in milliseconds.

NOTES

-For tone dialing using the shared tone generator, i.e. Dialing Modes "1" and "3", the duration of the OFF or interdigit time will increase per the demand on the tone generator; the larger the number of tone dialing lines, the longer the OFF time. The OFF setting with this parameter is thus the minimum interdigit time.
-For other tone dialing, i.e. both Dialing Modes "4" (TT using line-card tone generators, and DMF), the OFF time will always be as set with this parameter.

FOR DIAL PULSE ONLY

10.24 DIAL PULSE SPEED AND PERCENT BREAK

CALL PARAMETER/DATA DISPLAY

SPEED-BR 10-60;

Speed — Percent Break

FOR DIAL PULSE ONLY

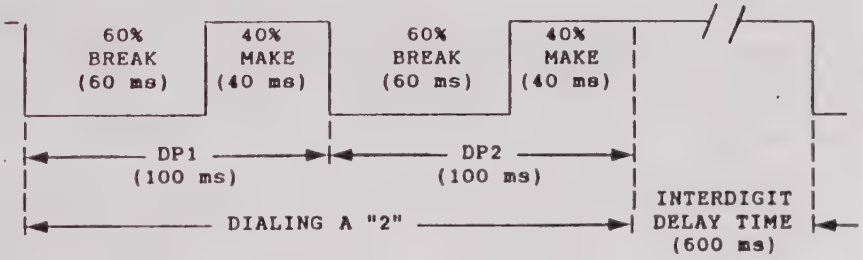
10.24 DIAL PULSE SPEED AND PERCENT BREAK, continued

Acceptable values:
Speed: 05 thru 25, in 01 Pulses Per Second steps
Percent Break: 40 thru 80, in 01 Percent steps

Recall "0" = 10-60, 10 PPS @ 60% Break

This parameter appears only if Dial Pulse (DP) is selected in Para. 10.19. It will not appear if tone dialing is selected.

The drawing below defines the parameters for Pulse Dialing. This example shows a "2" being dialed at a speed of 10 PPS, 60% Break and 600 ms Interdigit Delay Time (the Recall "0" settings). See Para. 10.25 for Interdigit Time prompt.



10.25 DIAL PULSE INTERDIGIT DELAY TIME

CALL PARAMETER/DATA DISPLAY

ID-DELAY 0600;

Acceptable values: 0150 thru 6000, in 25 ms steps

Recall "0" = 0600 milliseconds

This parameter appears only if Dial Pulse (DP) is selected in Para. 10.19. It will not appear if tone dialing is selected.

Interdigit Delay Time is the time from after one digit is outpulsed to the beginning of the outpulsing of the next digit. See the drawing in Para. 10.24, above, showing an Interdigit Delay Time of 600 ms.

10.26 CONVERSATION TIME

CALL PARAMETER/DATA DISPLAY

CONV TIME 0000;

Acceptable values: 0000
0006 thru 0255, in 0001 sec steps
0260 thru 1275, in 0005 sec steps

NOTE: 0001 thru 0005 sec, not allowed
1275 sec. = 21 min. 25 sec.
Recall "0" = 0000, no Conversation Time

This parameter sets the conversation (holding) time of each call on this line. In paired operation, there will be a voicepath confirmation check just before the Conversation Time and another voicepath confirmation check just before the end of the Conversation Time; see the sequence below:

The sequence (see Table 13-1 for complete call sequence):
1. Terminate Port Off-Hook (Ring Trip)
2. Cut Through Delay (see Para. 9.09)
3. Confirmation Tone sent from Terminate to Originate Port (1B)*
4. Confirmation Tone sent from Originate to Terminate Port (2B)* (two-way confirmation only)
5. Conversation Time begins
6. Confirmation Tone sent from Terminate to Originate Port (1E)*
7. Confirmation Tone sent from Originate to Terminate Port (2E)* (two-way confirmation only)
8. Conversation Time ends
9. Both Originate Port and Terminate Port on-hook (call ends)

* NOTE
The codes listed below are used in the Real Time Error Report (see Para. 14.08) to identify which Confirmation Tone was not received correctly:
1B = 1st Beginning Confirmation Tone, step 3 above
2B = 2nd Beginning Confirmation Tone, step 4 above
1E = 1st Ending Confirmation Tone, step 6 above
2E = 2nd Ending Confirmation Tone, step 7 above

10.27 START DELAY TIME

CALL PARAMETER/DATA DISPLAY

START DELAY 000;

10.27 START DELAY TIME, continued

Acceptable values: 001 thru 255, in 001 second steps

Recall "0" = 0000, no Start Delay

A Start Delay Time setting prevents the line from immediately coming off-hook after a START command (see Para. 13.03). The Start Delay Time begins after the initial START command; the line will wait to come off-hook until after the Start Delay Time expires. For Synchronous Mode of operation, Start Delay Time also delays the off-hooks during the course of a call. See Para. 9.04 for Call Generation Mode (Random or Synchronous).

Random Mode of Operation. For this mode, the Start Delay Time only delays the initial off-hook after the START command.

Synchronous Mode of Operation. For this mode, the Start Delay Time will:

A. After the START command, delay the initial off-hook time.
B. During the call, insert a delay after the Intercall Time (see Para. 10.17) of the slowest line; that is, delay the time that the line would otherwise go off-hook to begin the next call.

10.28 FLASH TIME

CALL PARAMETER/DATA DISPLAY

FLASH TIME 0500;

Acceptable values: 0050 thru 5000, in 0050 ms steps

Recall "0" = 0500 milliseconds (0.5 seconds)

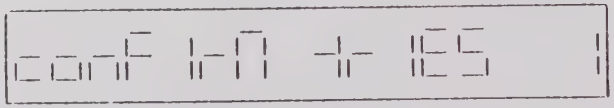
This parameter sets the length of the Hook Flash, entered in the Dialed Number Field (see Para. 10.06).

Flash Time only has meaning if there is at least one Hook Flash, "F", entered in the Dialed Number Field. If no Hook Flash is programmed in the Dialed Number Field, this setting is not used.

PAIRED MODE ONLY

10.29 CONFIRMATION TONE CHECK TRIES

CALL PARAMETER/DATA DISPLAY



CONFIRM TRIES 1;

Possible entries: 1 thru 9 tries
Recall "0" = 1 try

This parameter allows repeated tries of voicepath confirmation checks in the event the first try is unsuccessful. The Confirmation Tone Frequency and Direction are per the settings in Para. 10.12.

Repeated Confirmation Tones will be sent, if necessary, up to the number indicated by this setting, until the voicepath is successfully confirmed. The call will be counted as completed if a successful voicepath confirmation can be made within the number of allowable attempts indicated by this parameter.

For two-way confirmation, both the Terminate-to-Originate and the Originate-to-Terminate Confirmation Tones must be received correctly within the same attempt in order to successfully confirm the voicepath.

Data Registers will increment and Real Time Error Reports will be delivered, depending on the success of the voicepath confirmation check(s):

A. Successful Voicepath Confirmation
   1. The Calls Completed (COMPLETE) Data Register will increment if confirmation is made within the number of tries allowed by this prompt. See Para. 13.15.
   2. The first time it is necessary to try more than once to confirm the voicepath, the Real Time Error Report will indicate how many tries were required to confirm the voicepath. This serves as a warning that the voicepath was not confirmed on the first attempt. See "X CONF TRIES RQD" in Para. 14.08, 10).

B. Failed Voicepath Confirmation
   1. The Tone Failures (NO TONE) Data Register will increment if voicepath confirmation is not made within the number of tries allowed by this prompt. See Para. 13.13.
   2. If the voicepath is not confirmed within the number of tries allowed, the Real Time Error Report will indicate which tone was not received successfully on the last attempt (last allowable try); failures before the last try are not recorded. See Para. 14.08, 6), 7), 8) and 9).

PAIRED MODE ONLY

10.29 CONFIRMATION TONE CHECK TRIES, continued

When Conversation Time is programmed (see Para. 10.26), this parameter applies to both sets of voicepath confirmation checks.

NOTE

This parameter only applies to Paired Mode of operation (as set in Para. 10.11); in Unpaired Mode, it is not possible to repeat an unsuccessful voicepath confirmation check because the Originate Port does not know from which Terminate Port the Confirmation Tone is generated and the Terminate Port does not know to which Originate Port its Confirmation Tone is directed.

NOTES ABOUT DATA REGISTERS

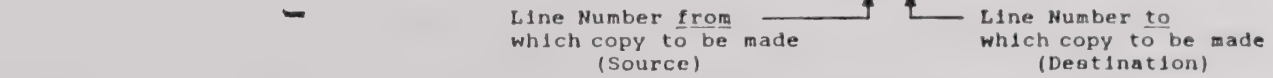
-The displays that appear after the "CONFIRM TRIES" prompt (Para. 10.29, above) are Data Registers; the information in the Data Registers is not user-programmable. The Data Registers record the AM1 PLUS test results. See Para. 13.08 thru Para. 13.17 for descriptions of the Data Registers.
-To distinguish between a Line Parameter prompt and a Data Register, note that there is a flashing cursor in the blank space before the result in the Data Register display. As a rule, for Line Parameter prompt displays, the digit to be programmed will be flashing. In some cases there will be a flashing cursor where a digit is to be programmed, i.e. at a blank space in the Dialed Number Field, or if a + (blank) or - is to be entered before the value.

10.30 COPYING LINE PARAMETERS

The Line Parameters described in this section may be copied from one line to another specific line or to all the other lines by executing a COPY command.

To execute a COPY command:

1. Press [SHIFT,D][5,COPY]
2. Display will show "COPY 01-01"



3. Enter the desired Source and Destination Line Numbers
4. To copy to all the other lines, enter "99" as the Destination.

10.30 COPYING LINE PARAMETERS, continued

With the general copy procedure listed above, all line parameters in this section will copy except the parameters listed below.

Para. 10.04	ORIGINATE PORT LOCATION
Para. 10.05	TERMINATE PORT LOCATION
Para. 10.06	DIALED NUMBER FIELD
Para. 10.13	ORIGINATE/TERMINATE CONFIRMATION TONES
Para. 10.27	START DELAY TIME

The parameters listed above are generally set individually for each line; see NOTE below for exception. Use the [ETR/STP LINE,C] key to conveniently enter a line parameter and then step to the same parameter in the next line.

NOTE

To copy all Line Parameters from one line to all other lines, enter "98" as the Destination. All the Line Parameters which are normally not copied (list of 5 parameters above) are included with this copy.

10.31 LINE PARAMETER STORE/RECALL

The Line Parameter settings described in this section can be Stored in EEPROM non-volatile memory. Line Parameters previously stored in EEPROM memory can be Recalled. See Para. 11.09 and Para. 11.10. See Para. 11.08 for instructions to store parameters on Cassette tape.

10.32 LINE PARAMETER PRINTOUTS

If the Basic Unit is equipped with the RS232 Port Option (see Para. 14.02), see Para. 14.09 for instructions to print out Line Parameter settings. SPECIAL FUNCTION 1 is used to print out the Line Parameters of the presently selected line. SPECIAL FUNCTION 2 is used to print out the Line Parameters (and Unit Parameters) for all lines.

11. MEMORY CONSIDERATIONS

11.01 INTRODUCTION

This section describes the AM1 PLUS memory devices and functions that are used to store and recall call scenarios (Parameters and Telephone Numbers). Power-failure Memory backup is also discussed

Once a routine call scenario has been established, by setting the Unit Parameters (Section 9) and Line Parameters (Section 10), it can be stored and later recalled for the next testing session; this avoids programming the AM1 PLUS each time the same test is repeated.

The paragraphs in this section are listed below:

11.02 General Memory Information
11.03 Memory Backup Battey
11.04 Real Time Clock
11.05 RAM
11.06 EEPROM (Memory Locations 1,2,3,4)
11.07 EPROM (Memory Location 0)
11.08 Cassette Recorder Option
11.09 Store to EEPROM: Special Function A
11.10 Recall from EPROM & EEPROM: Special Function B

11.02 GENERAL MEMORY INFORMATION

Definitions. Some expressions that are used with respect to memory are defined below:

Parameters: The combination of Unit Parameters (Section 9) and Line Parameters (Section 10) which are stored/recalled together.

Telephone Number: Contents of Dialed Number Field (Para. 10.06).

Cold Start: When power is applied to the AM1 PLUS by setting the Power Switch to ON. The Real Time Clock must be set (Para. 9.02) and the Parameters that come up are determined by the Power-On Recalls (Para. 9.10 and Para. 9.11).

Warm Start: When power is applied to the AM1 PLUS with the Power Switch already in the ON position:

1. When power is established again after a power failure or
2. By plugging in the power cord again after having previously disconnected the power cord with power applied to the unit.

The Backup Battery preserves the Real Time Clock, Parameter settings and contents of the Data Registers that were in RAM at the time of power disconnection.

Memory Areas and Locations. There are five (5) memory areas associated with the AM1 PLUS, as illustrated in Fig. 11-1:

-Real Time Clock
-RAM, Random-Access Memory
-EEPROM, Electrically-Erasable Programmable Read-Only Memory
-EPROM, Erasable Programmable Read-Only Memory (factory set)
-Cassette Tape (Optional)

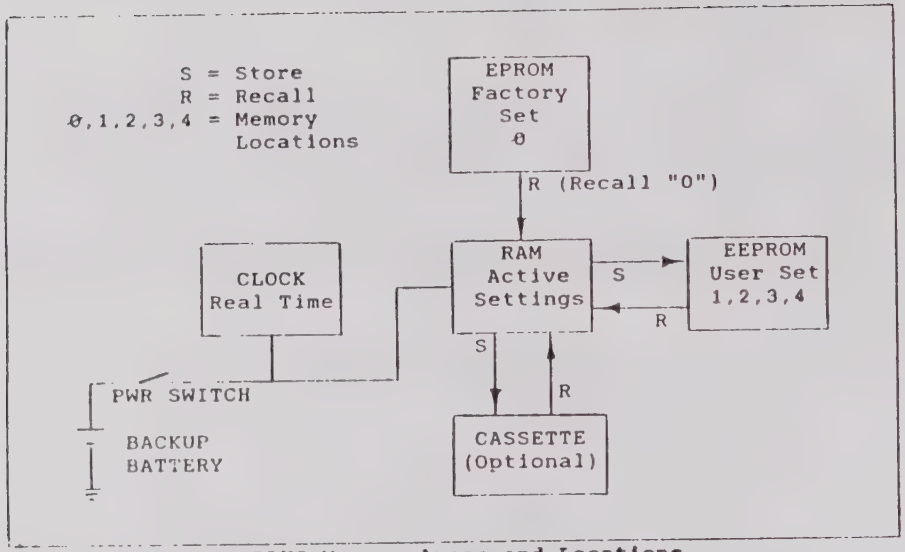


Figure 11-1. AM1 PLUS Memory Areas and Locations

Volatile Memories. Volatile Memory is preserved only when power is applied. The **RAM** and Clock are Volatile Memories with battery backup in the event of a power failure. The battery backup will only operate, however, if the Power Switch is left ON, as shown in Fig. 11-1. To preserve the Clock and the contents of the RAM when moving from one power source to another:

1. Leave Power Switch ON.
2. Unplug power cord from original power source.
3. Plug power cord into new power source ("warm start").

It is necessary to keep the Power Switch ON if it is desired to keep the Clock running and/or keep the contents of the Data Registers. The contents of the Data Registers cannot be stored in non-volatile memory and the Clock will always reset to zero when the Power Switch is turned OFF.

Non-Volatile Memories. Non-Volatile Memory is preserved regardless of whether power is applied or not. The **EEPROM, EPROM** and Cassette are Non-Volatile Memories.

Store and Recall. Active (in RAM) Parameters and Telephone Numbers can be stored into any of four (4) EEPROM memory locations (1,2,3,4); the same information stored in EEPROM can be later recalled to RAM. The factory-set Parameters stored in EPROM (memory location 0) can also be recalled to RAM. With the Cassette Option, Parameters and Telephone Numbers in RAM can be stored on a cassette tape and later recalled back to RAM.

11.02 GENERAL MEMORY INFORMATION, continued

NOTE

-When a Recall is done, the recalled values write over the information previously entered in RAM.
-The Clock and Data Register contents cannot be Stored or Recalled.

Power-On Recall. Before turning OFF the Power Switch, settings can be made to determine which Parameters and Telephone Numbers will automatically be written to RAM when the Power Switch is next turned ON ("cold start"); see Para. 9.10 and Para. 9.11. Any of the memory locations 0 thru 4 can be chosen to be recalled when the Power Switch is turned ON. This feature is especially useful to:

1. Preset parameters before going to the field.
2. Store these parameters in certain EEPROM locations.
3. Set the Power-On Recall to recall these EEPROM locations.
4. When the AM1 PLUS is turned ON in the field, the same preset parameter settings will be enabled automatically.

Because of this Power-On Recall feature, there are not a fixed set of "default" Parameter and Telephone Number settings that will come up with a "cold start". The factory-set Parameter values will not necessarily come up when the Power Switch is first turned ON. Factory-set parameters, stored in EPROM, will only come up with a "cold start" when Power-On Recalls in Para. 9.10 and Para. 9.11 are set to "PWR RCL TEL 0" and "PWR RCL PARAM 0". Note that there are no Telephone Numbers (blank Dialed Number Fields) with "PWR RCL TEL 0". Parameter values with "PWR RCL PARAM 0" are the Recall "0" values of Sections 9 and 10.

Memory Information Displays. There are two (2) displays at the end of the Unit Parameters which record:

1. Last Recalled Telephone Number memory location (Para. 9.12) and
2. Last Recalled Parameters memory location (Para. 9.13)

After a recall, these displays assure the user that a recall did indeed take place and records the last recall for future reference.

Printouts. For an AM1 PLUS equipped with an RS232 port, all RAM Parameter settings and the contents of the Data Registers can be output for printing or for display on a terminal monitor; see Para. 14.09,A thru C. The information stored in EEPROM can also be printed out; see Para. 14.09,D.

In the paragraphs that follow, each of the five (5) memory areas shown in Fig. 11-1 are described along with the store and recall functions associated with each. Table 11-1 summarizes AM1 PLUS memory information and references the paragraphs where detailed information can be found.

11.02 GENERAL MEMORY INFORMATION, continued

Table 11-1
Store Recall, Copy & Print Functions

MEMORY AREA	STORE & COPY	RECALL & PRINT
RAM Active Settings (seen on display)	Press key [ETR/STP PARAM,B] or [ETR/STP LINE,C] to enter a new value into RAM. Copy Line Param (Para. 10.30) Store functions listed below:	SPCL FUNCTIONS 1, 2, and 3 and Auto Hourly Printout are used to print Data and Parameters from RAM using the RS232 port. (Para. 14.09,A thru C, 14.07) Parameter values and Telephone Numbers are written back into RAM using Recall functions listed below, labeled with an asterisk (*):
EEPROM (locations 1,2,3,4)	SPCL FUNCTION A (Para. 11.09)	SPCL FUNCTION B* (Para. 11.10) Power-On Recall*(Unit Param) (Para. 9.10, 9.11) Last Recall (Unit Param) (Para. 9.12, 9.13) SPCL FUNCTION D, Print Stored Values from EEPROM (Para. 14.09,D)
EPROM (location 0)	Factory-Set. User cannot store values.	
Cassette Tape (option)	SPCL FUNCTION 7 (Para. 11.08)	SPCL FUNCTION 6* (Para. 11.08)

11.03 MEMORY BACKUP BATTERY

The Backup Battery preserves the contents of the RAM and keeps the Real Time Clock running during a power outage. The Backup Battery will only be connected if the Power Switch is ON, as shown in Fig. 11-1. The AM1 PLUS has auto-restart circuitry which causes it to resume operation when power returns ("warm start").

When the power fails or the power cord is disconnected, and the AM1 PLUS has an RS232 port, a message will be output giving the time and date of power loss and power return. See Para. 14.10,A.

The Backup Battery is a Lithium Battery (Model 18-0001), located on the CPU/Memory/RTC board. This battery will provide a minimum of 500 hours of battery-backed memory. To preserve the Backup Battery, do not leave the Power Switch in the ON position, without power connected, for an extended period of time. See Para. D.05 for instructions to replace the Backup Battery.

11.04 REAL TIME CLOCK

See Para. 9.02 for instructions to set the Real Time Clock. The Real Time Clock is a Unit Parameter but is unique in that:

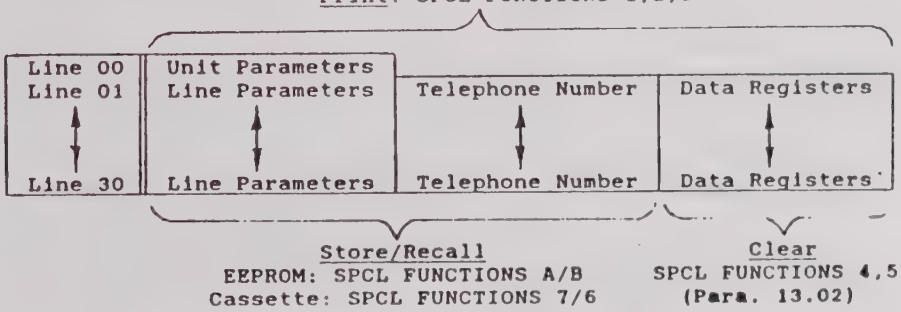
A. The clock cannot be stored/recalled.
B. With a "cold start", clock time goes to default value.

The Real Time Clock will continue to run during a power failure, being powered with the Backup Battery. Thus it is not necessary to reset the clock with a "warm start".

11.05 RAM

The RAM (Random Access Memory) is a volatile memory with battery backup in the event of a power failure. The RAM contains the active settings that direct the operation and record the results when the AM1 PLUS is running. The operation commands are contained in the Unit Parmeters, Line Parameters and Telephone Numbers; the results are recorded in the Data Registers. The RAM contents and associated Special Function commands are illustrated in Table 11-2.

Table 11-2
Contents of RAM and Associated Special Functions



See references below for detailed information on RAM contents:

- -For Unit Parameters see Section 9.
- -For Line Parameters see Section 10.
- -For Telephone Number (Dialed Number Field) see Para. 10.06.
- -For Data Registers see Para. 13.07 thru Para. 13.17.

Note the following concerning the RAM:

- -Line Parameters can be copied from one line to another (Para. 10.30)
- -The Unit Parameters and all 30 Line Parameters are stored and recalled as a block, referred to as "Parameters".
- -All 30 Telephone Numbers are stored and recalled as a block, independent from the Parameters.
- -The contents of RAM can be stored in EEPROM with SPCL FUNCTION A (Para. 11.09).
- -Information is written into RAM from EPROM or EEPROM using recall SPCL FUNCTION B (Para. 11.10).
- -To clear all Data Registers, use SPCL FUNCTION 4 (Para. 13.02). To clear selected line Data Registers, use SPCL FUNCTION 5 (Para. 13.02).

Also note the following concerning the RAM:
- -Data Register contents cannot be stored or recalled.
- -Data Register contents can be automatically printed out every hour (Para. 9.05 and 14.07).

RAM Print commands for AM1 PLUS with an RS232 port (Para. 14.09):
- -SPCL FUNCTION 1 prints Parameters, Telephone Number and contents of the Data Registers for the line selected.
- -SPCL FUNCTION 2 prints Parameters, Telephone Numbers and contents of the Data Registers for all lines.
- -SPCL FUNCTION 3 prints contents of the Data Registers for all lines.

RAM Store/Recall commands for AM1 PLUS with Cassette option:
- -The contents of RAM can be stored on Cassette tape with SPCL FUNCTION 7 (Para. 11.08).
- -Information is written into RAM from Cassette tape with recall SPCL FUNCTION 6 (Para. 11.08).

11.06 EEPROM (MEMORY LOCATIONS 1,2,3,4)

The EEPROM (Electrically-Erasable Programmable Read-Only Memory) is used to store and recall call scenarios (Parameters and Telephone Numbers). It is a user-programmable non-volatile memory device. The EEPROM has four (4) storage locations for Parameters and four (4) storage locations for Telephone Numbers -- locations 1,2,3, and 4.

Unlike the RAM, the EEPROM does have a limited lifetime, although practically speaking it has more than enough lifetime to last its intended use. The EEPROM can take about 10,000 writes before wearing out and it is unlikely that a user would need to make that many stores for many years in routine use of the AM1 PLUS. In previous AM1 models, store and recall was only possible by external Computer Downloading or with the Cassette Recorder. The Cassette Recorder option is still available with the AM1 PLUS, but it is unlikely to be needed except in applications where more storage is necessary than can be done with the EEPROM, i.e. where more than four (4) sets of Parameters and Telephone Numbers need to be stored simultaneously. See Table 11-1 for EEPROM Store, Recall and Print functions.

11.07 EPROM (MEMORY LOCATION 0)

The EPROM (Erasable Programmable Read-Only Memory) is a factory-set non-volatile memory device. It contains Unit Parameters and Line Parameters that are considered to be typical values for the majority of applications. It also contains a set of 30 blank Dialed Number Fields (Telephone Numbers). The EPROM is memory location 0. The values in EPROM are the "Recall 0" values listed in Section 9 and Section 10.

It is only possible for the user to read from the EPROM (recall). The user cannot write to the EPROM (store). Also, it is not possible to directly print out the contents of EPROM, although this could be done indirectly by first writing the EPROM information into RAM (with SPCL FUNCTION 8) and then printing out the contents of the RAM (with SPCL FUNCTION 2).

11.07 EPROM (MEMORY LOCATION 0), continued

Because the EPROM contains typical Parameter values, before setting Parameters it is recommended to do a recall with SPCL FUNCTION B and enter "0" for the memory location (RECALL PARAM 0). To start with blank Telephone Numbers, enter "RECALL TEL NO 0" with SPCL FUNCTION B. See Para. 11.10.

11.08 CASSETTE RECORDER OPTION

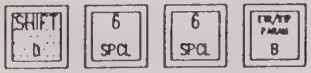
The purpose of the Cassette Recorder Option (28-0005) is to give more memory space in addition to EEPROM memory to store and recall call scenarios (Parameters and Telephone Numbers). Since the EEPROM is standard with the AM1 PLUS, and has four (4) storage locations, the the Cassette Recorder Option would only be needed if a user had to store more than four (4) sets of call scenarios at one time.

The Cassette Recorder Option provides an RS232 port and Cassette interface. The Cassette interface is a circular DIN connector, item 1 in Fig. 4-1. The Model 24-0002 Cassette Recorder is used with the Cassette interface. A cable is included with each Cassette Recorder for connection to the DIN connector. Note that the Cassette Recorder has its own separate instruction manual (Part No. 18-0002).

To **STORE** Parameters and Telephone Numbers onto Cassette, use SPCL FUNCTION 7 (to include Lines 20 thru 30, be sure that at least one of the 20 thru 30 Line Enable Switches is ON):

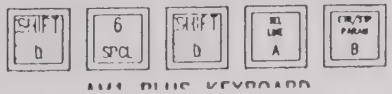
SPECIAL FUNCTION 7, STORE TO CASSETTE	
AM1 PLUS KEYBOARD	[D] [6] [7] [B] TERMINAL KEYBOARD

To **RECALL** Parameters and Telephone Numbers from Cassette, use SPCL FUNCTION 6:

SPECIAL FUNCTION 6, RECALL FROM CASSETTE	
 AM1 PLUS KEYBOARD	[D] [6] [6] [B] TERMINAL KEYBOARD

11.09 STORE TO EEPROM: SPECIAL FUNCTION A

To **STORE** Telephone Numbers and Parameters in EEPROM, use SPCL FUNCTION A:

SPECIAL FUNCTION A, STORE TO EEPROM	
	[D] [6] [D] [A] [B]

11.09 STORE TO EEPROM: SPECIAL FUNCTION A, continued

Follow the instructions below as the respective prompts come up:

CALL PARAMETER/DATA DISPLAY

SPCL FUNCTION A;

STORE TEL NO 9;

Possible entries:
- 9 = no operation (default), i.e. do not store Telephone Numbers
- 1 = store Telephone Numbers in EEPROM location 1
- 2 = store Telephone Numbers in EEPROM location 2
- 3 = store Telephone Numbers in EEPROM location 3
- 4 = store Telephone Numbers in EEPROM location 4

Enter 1, 2, 3 or 4 to store Telephone Numbers or leave the 9 to not store Telephone Numbers.

Press [ETR/STP PARAM,B] to enter the value selected and bring up the next prompt:

STORE PARAM 9;

Possible entries:
- 9 = no operation (default), i.e. do not store Parameters
- 1 = store Parameters in EEPROM location 1
- 2 = store Parameters in EEPROM location 2
- 3 = store Parameters in EEPROM location 3
- 4 = store Parameters in EEPROM location 4

Enter 1, 2, 3 or 4 to store Parameters or leave the 9 to not store Parameters.

Press [ETR/STP PARAM,B] to enter the value selected and exit SPCL FUNCTION A.

11.10 RECALL FROM EPROM & EEPROM: SPECIAL FUNCTION B

To RECALL Telephone Numbers and Parameters from EPROM & EEPROM, use SPCL FUNCTION B:

SPECIAL FUNCTION B, RECALL FROM EPROM/EEPROM	
SHIFT 0 · 6 SPCL · SHIFT 0 · CR/STP PARAM B · CR/STP PARAM B	[D] [6] [D] [B] [B]
AM1 PLUS KEYBOARD	TERMINAL KEYBOARD

Follow the instructions below as the respective prompts come up:

CALL PARAMETER/DATA DISPLAY

SPCL FUNCTION B:

RECALL TEL NO 9;

Possible entries:
- 9 = no operation (default), i.e. do not recall Telephone Numbers
- 0 = recall blank Dialed Number Fields from EPROM
- 1 = recall Telephone Numbers from EEPROM location 1
- 2 = recall Telephone Numbers from EEPROM location 2
- 3 = recall Telephone Numbers from EEPROM location 3
- 4 = recall Telephone Numbers from EEPROM location 4

Enter 0, 1, 2, 3 or 4 to recall Telephone Numbers or leave the 9 to not recall Telephone Numbers.

Press [ETR/STP PARAM,B] to enter the value selected and bring up the next prompt:

11.10 RECALL FROM EPROM & EEPROM: SPECIAL FUNCTION B, continued

CALL PARAMETER/DATA DISPLAY

RECALL PARAM 9;

Possible entries:
- 9 = no operation (default), i.e. do not recall Parameters
- 0 = recall factory-set Parameters from EPROM*
- 1 = recall Parameters from EEPROM location 1
- 2 = recall Parameters from EEPROM location 2
- 3 = recall Parameters from EEPROM location 3
- 4 = recall Parameters from EEPROM location 4

Enter 0, 1, 2, 3 or 4 to recall Parameters or leave the 9 to not recall Parameters.

Press [ETR/STP PARAM,B] to enter the value selected and exit SPCL FUNCTION B.

*NOTE
The factory-set Parameter values recalled from EPROM are referred to as Recall "0" values in Section 9 and Section 10.

12. TEST SETUP: CONFIGURATIONS AND CONNECTIONS

12.01 INTRODUCTION

This section covers three (3) main subjects:

A. Possible Testing Configurations
   1. Trunk-to-Trunk
   2. Trunk-to-Line
   3. Line-to-Trunk
   4. Line-to-Line

B. Possible Ports/Interconnections Between AM1 Units
   1. Types of Ports
   2. Basic Units
   3. Expansion Units
   4. T1 Adaptor Units

C. Physical Configurations
   1. Stacking Portable Units
   2. Rack Mounting

This section is arranged according to the steps one would take t select and connect equipment per the desired testing configura tion. Follow the steps below:

1. According to the type of testing to be done, determine the desired configuration. See Para. 12.02 and Fig. 12- thru 12-6.
2. Read interconnection guidelines in Para. 12.03.
3. Determine type(s) and number of Originate and Terminate Ports needed. See Para. 12.04 for description of ports and Table 12-1 for types of ports in each unit.
4. Select AM1 PLUS/AM1XT units needed; if amount of traffic is a factor, see Para. 15.02 about Call Rate.
5. Stack or rack mount units as required; see Para. 12.05.
6. Select appropriate interconnect and line cables per Para. 12.06. Table 12-3 lists the available cables.
7. Install interconnect cables per Para. 12.06.
8. See Para. 12.07 for some typical interconnections.

The paragraphs in this section are listed below:

12.02 Typical Testing Configurations
12.03 Guidelines for Interconnecting AM1 PLUS Units
12.04 AM1 PLUS Ports
12.05 Stacking and Rack Mounting
12.06 Cable Selection and Connection
12.07 Typical Interconnections Between AM1 PLUS Units
12.08 T1/Analog Application Note

12.02 TYPICAL TESTING CONFIGURATIONS

Figure 12-1 shows the general types of Originate/Terminate Configurations with the AM1 PLUS:

A. Trunk-to-Trunk
B. Trunk-to-Line
C. Line-to-Trunk
D. Line-to-Line

A "Line" has an Analog Port and a "Trunk" has a T1 (PCM) Digital Port. Figures 12-2 thru 12-6 show some specific ways of configuring AM1 PLUS units to test PBXs and Switches.

12.02 TYPICAL TESTING CONFIGURATIONS, continued

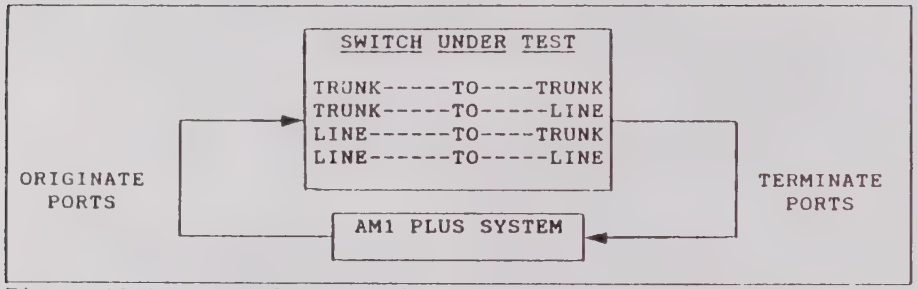


Figure 12-1. General Types of Originate/Terminate Configurations

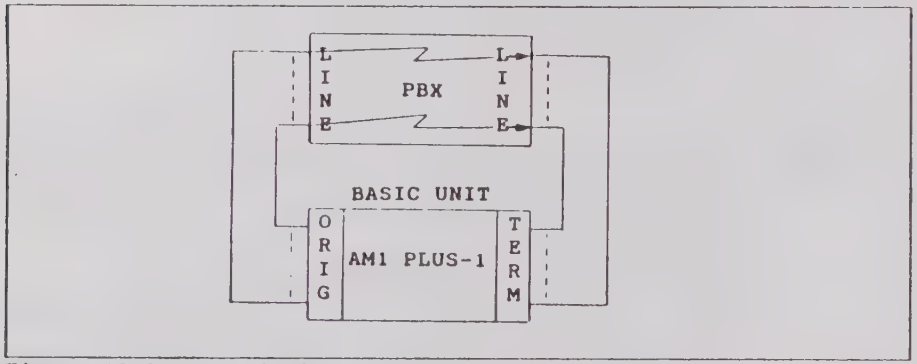


Figure 12-2. PBX (Private Branch Exchange) Line-to-Line Testing

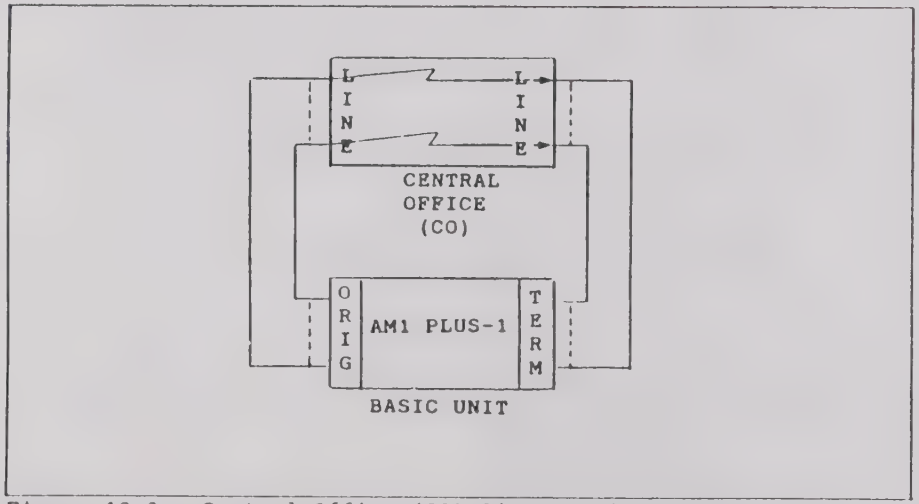


Figure 12-3 Central Office (CO) Line-to-Line Testing

12.02 TYPICAL TESTING CONFIGURATIONS, continued

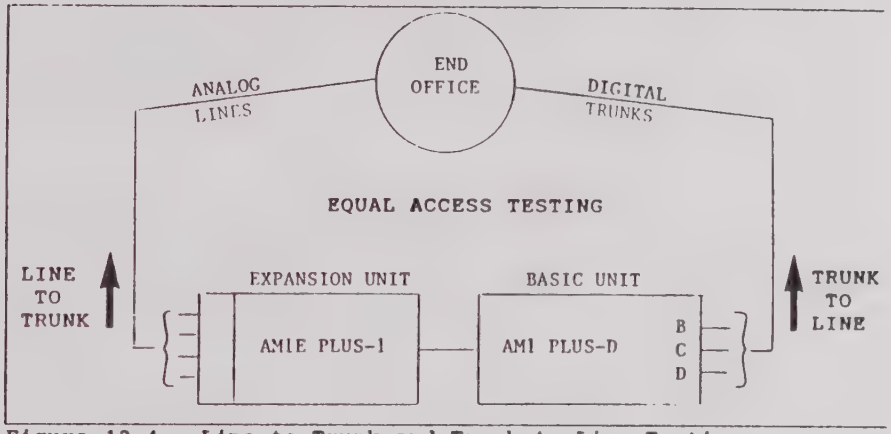


Figure 12-4. Line-to-Trunk and Trunk-to-Line Testing

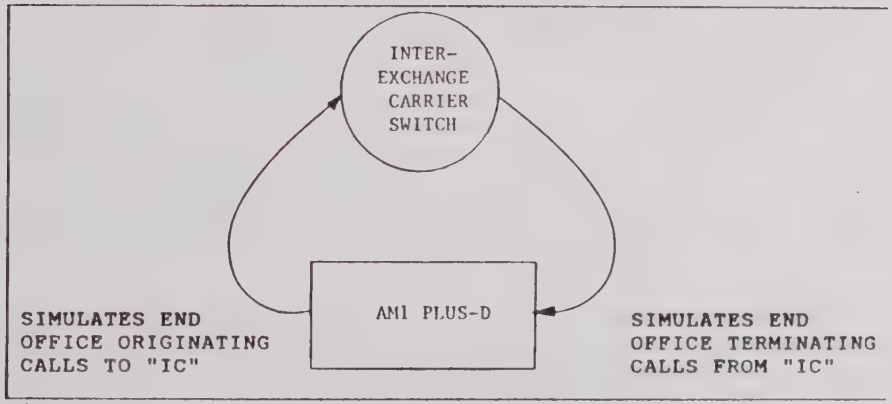


Figure 12-5. Trunk-to-Trunk Equal Access Testing

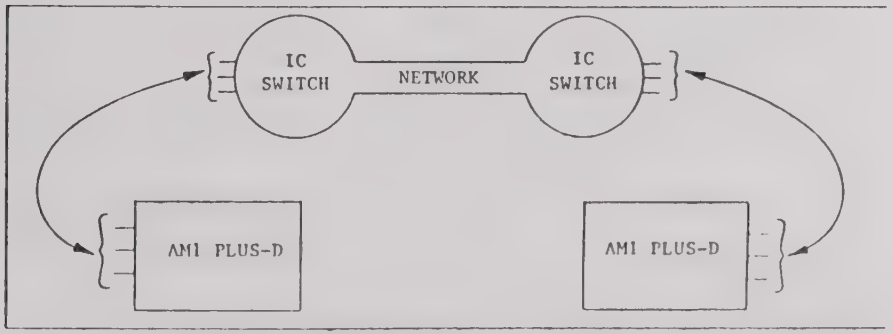


Figure 12-6. Network Testing

12.03 GUIDELINES FOR INTERCONNECTING AM1 PLUS UNITS

See Fig. 12-7 for ways AM1 PLUS units can interconnect. The guidelines for interconnecting AM1 units are listed below:

A. There are four (4) types of Basic Units, four (4) types of Expansion Units and two (2) types of T1 Adaptor Units. See illustrations in Fig. 1-1 thru 1-9 and Fig. 19-1; see Sections 5 thru 8 and 19 for detailed descriptions.

B. The basic building block is an AM1 PLUS Basic Unit.

C. A "Set" can be any of the four (4) interconnections listed below:
   1. Basic Unit
   2. Basic Unit + Expansion Unit
   3. Basic Unit + T1 Adaptor
   4. Basic Unit + Expansion Unit + T1 Adaptor Unit

•D. Any one (1) AM1E PLUS Expansion Unit may be connected to any one (1) AM1 PLUS Basic Unit, except AM1 PLUS 20/20.

E. A T1 Adaptor Unit can be connected to either analog AM1 PLUS Basic Unit (AM1 PLUS-1 or AM1 PLUS-2).

F. There are a maximum of 30 Originate and 30 Terminate Ports programmable within any Set.

G. Up to 15 Sets can be Chained for a maximum System capacity of 450 Originate and 450 Terminate Ports.

H. Rules when mixing AM1 PLUS and AM1XT units in a Set:
   1. The Basic Unit is the controlling factor; it determines the software version level.
   2. With an AM1 PLUS Basic Unit, connect either an AM1E PLUS Expansion Unit or an AM1EXT Expansion Unit.

      NOTE

      If an AM1 PLUS Basic Unit is connected with an AM1EXT-1 Expansion Unit, Dialing Mode 4 (Para. 10.19) and Answer Supervision (Para. 10.14) are not operative for the AM1EXT-1 lines; all other AM1 PLUS Unit and Line Parameters are operative, however.
   3. With an AM1XT Basic Unit, connect an AM1EXT Expansion Unit only. An AM1E PLUS Expansion Unit will not work with an AM1XT Basic Unit.

•Ground Start operation can not be used with the E&M Basic Unit. When an AM1E PLUS-1, AM1E PLUS-3, AM1EXT-1 or AM1EXT-3 Expansion Unit is connected to an AM1 PLUS-2 Basic Unit, use the Loop/Ground Start Analog ports in Loop Start only.

12.04 AM1 PLUS PORTS

Port Description. The three (3) types of line-interface ports available with AM1 PLUS units are described below:

A. LOOP: 2-Wire (Tip and Ring), 900 Ohm, with 1200 Ohm (600 Ohm optional) simulated dc loop resistance. Frequency-selective call-completion tone register. Originate Port: loop start, ground start, or wink start; call progress tone detector (dial tone, 60 IPM, 120 IPM). Terminate Port: broadband ring detector.

B. E&M: 2-Wire (+E&M wires) or 4-Wire (+E&M wires) 600 Ohm type I, II, III, IV or V. Trunk or switch emulation. Wink start, delay start, immediate start or dial tone start.

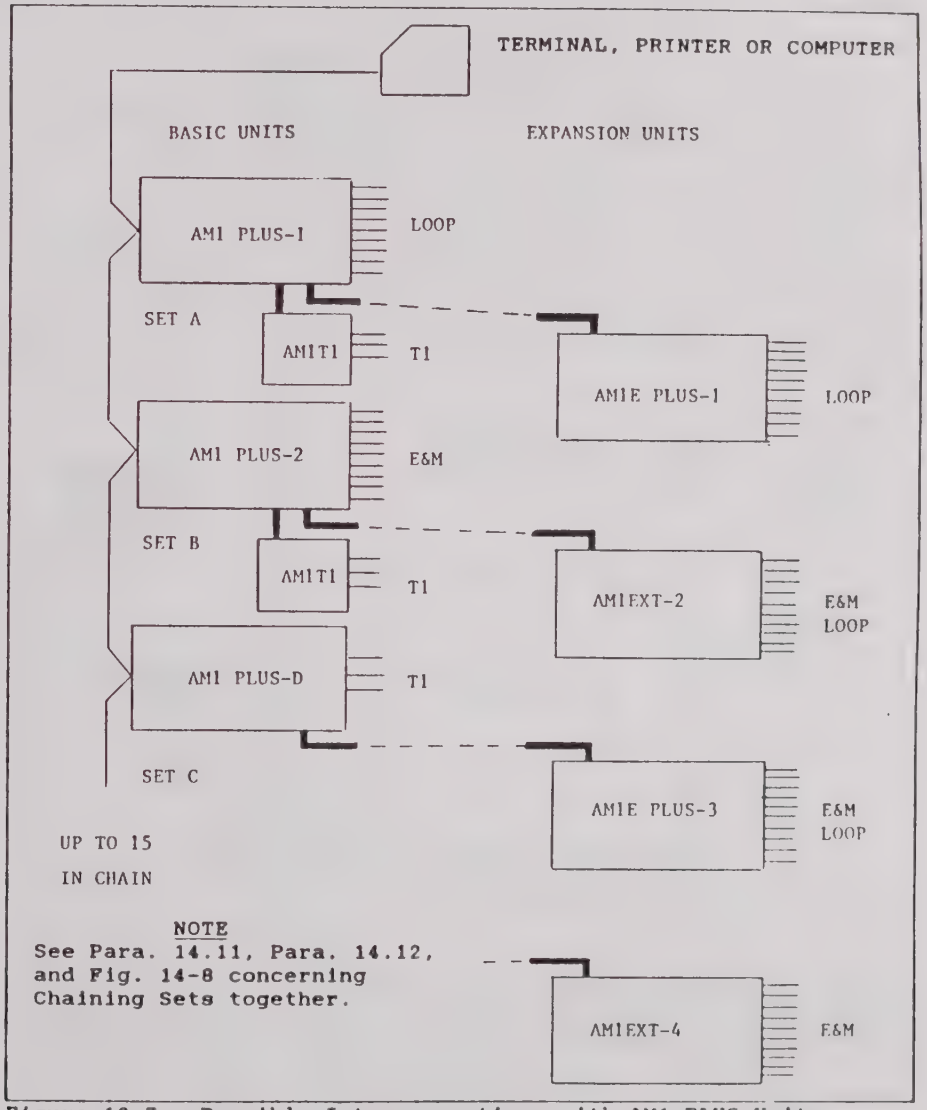


Figure 12-7. Possible Interconnections with AM1 PLUS Units

12.04 AM1 PLUS PORTS, continued

Port Description, continued

C. T1 (PCM): 4-Wire (T,R and T1,R1) 100 Ohm. 1.544 Mbps (DS-1), 24-channel, D3/D4 format operating in loop timing mode (transmit clock locked to receive clock). 1.5 V peak minimum pulse amplitude.

Types of Ports of Units. See Table 12-1 for the quantity and types of ports with each AM1 PLUS unit.

Table 12-1
AM1 PLUS/AM1EXT Port Assignment

MODEL	ORIGINATE PORTS		TERMINATE PORTS	
	QUANTITY	TYPE	QUANTITY	TYPE
AM1 PLUS-1 Basic	10	Loop Start/ Ground Start	10	Loop
AM1 PLUS-2 Basic	10	2 or 4-Wire * E&M	10	2 or 4-Wire * E&M
AM1 PLUS-D Basic	30	3 T1 Span Lines (24 Channels each)	30	3 T1 Span Lines (24 Channels each)
AM1E PLUS-1 Expansion	20	Loop Start/ Ground Start	20	Loop
AM1EXT-2 Expansion	20	2 or 4-Wire E&M	20	Loop
AM1E PLUS-3 Expansion	8	2 or 4-Wire E&M	20	Loop
	12	Loop Start/ Ground Start		
AM1EXT-4 Expansion	20	2 or 4-Wire * E&M	20	2 or 4-Wire * E&M
AM1T1-1 T1 Adaptor (connected to one Basic Unit)	30	3 T1 Span Lines (24 Channels each)	30	3 T1 Span Lines (24 Channels each)
AM1T1-2 T1 Adaptor (connected to two Basic Units)	60	6 T1 Span Lines (24 Channels each)	60	6 T1 Span Lines (24 Channels each)

* These E&M Ports can only emulate Transmission Equipment (T.E.).

Combinations of Ports. See Para. 12.03 for guidelines to interconnect AM1 PLUS units. Use Table 12-1 to choose the desired combination of ports.

EXAMPLE: There is a requirement to add E&M Originate and E&M Terminate Ports to an AM1 PLUS-1 Basic Unit. Using Table 12-1 above, an AM1EXT-4 Expansion Unit is chosen. The total quantity and types of ports for this combination are listed below:

Combination	Programmable Ports
AM1 PLUS-1 + AM1EXT-4	10 loop/ground start + 20 E&M Originate Ports and 10 loop + 20 E&M Terminate Ports

12.05 STACKING AND RACK MOUNTING

Stacking. AM1 PLUS portable units can be stacked on top of one another to minimize floor space. To Stack portable units:

1. Use plastic brackets on rear panels of carrying cases.
2. Remove and re-install the brackets per Fig. 12-8:
   a. Unscrew the rubber feet (from the outer set of bracket holes).
   b. At each outside edge where two adjacent units meet, slide a bracket until the middle set of holes in the bracket line up with the feet mounting holes.
   c. Re-install the rubber feet.
   d. For each installation, there will be a pair of brackets left over.

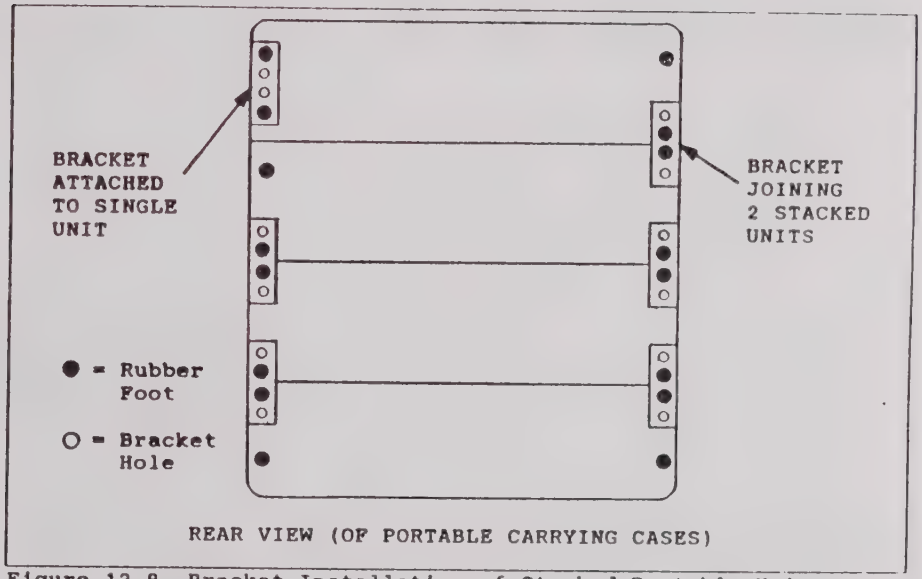

BRACKET ATTACHED TO SINGLE UNIT
BRACKET JOINING 2 STACKED UNITS
● = Rubber Foot
○ = Bracket Hole
REAR VIEW (OF PORTABLE CARRYING CASES)

Figure 12-8. Bracket Installation of Stacked Portable Units

Rack Mounting. Rack-mount units are designed for installation in 19" relay racks. Mounting brackets are attached at the factory, ready to directly install the unit. Rack mounting screws are supplied by the customer. All electrical connections are made at the front panel, identical to a portable unit. Rack-mount units have a rear cover to protect circuitry against shorts. Table 12-2 lists the vertical rack space occupied by rack-mount units.

Table 12-2
Vertical Rack Space for Rack-Mount Units

MODEL	VERTICAL RACK SPACE
AM1 PLUS-1 AM1XT-1 AM1 PLUS-2 AM1XT-2	7 Inches
All Other	5 1/4 Inches

12.06 CABLE SELECTION AND CONNECTION (Table 12-3 and Table 12-4)

Once the required AM1 PLUS units have been selected, use Table 12-3 to determine what Cables/Panel Adaptors are needed; use Table 12-4 to reference the Table or Figure where the pinouts and wire colors are listed.

Cables. Some cables are supplied as standard equipment with the corresponding unit, whereas other cables are options and must be ordered separately.

Cables are illustrated and described in Sections 3 thru 8 and 14. See Table 12-3 for a summary; Table 12-3:

A. Lists all the cables available
B. References the figure in which the cable is illustrated
C. Indicates with which units the cable is used

Note that all line cables are optional equipment; however, each unit must have line cables in order to connect the AM1 PLUS to switch under test.

Procedure to be sure to have all required cables:

1. Go to Table 12-3.
2. On right side of table, locate the selected unit(s).
3. Go down the column(s) below the selected unit(s) and confirm that supplied cables ("S") are with the unit(s).
4. Determine if any of the optional cables ("O") are required for the test setup.
5. Order optional cables as required.

Panel Adaptors. For convenient connect/disconnect of line connections, some units have an optional Panel Adaptor. A Panel Adaptor combines the individual line connections into one or more AMP connectors. Panel Adaptors 48-0018, 48-0018-12 and 48-0103 mount directly on the front panel of the Basic Unit or Expansion Unit. Panel Adaptors 36-0002, 36-0003 and 36-0004 are separate rack-mounted panels.

Connector Pin Assignments. The pin assignments and wire colors for the connectors are listed in Sections 3, 5 thru 8 and 14. See Table 12-4 for a summary; Table 12-4:

A. Lists the cables and adaptors for which pin assignments and /or wire colors are listed in this manual.
B. References the Table (T) or Figure (F) where the pinouts are listed.
C. Indicates with which unit(s) the cable or adaptor is used.

Order of Connecting Cables. If an Expansion Unit and/or T1 Adaptor is used with a Basic Unit, follow the steps below:

1. First, interconnect the two(2) units with the 48-0001 and/or 48-0056 cable.
2. Then, connect the power cord(s) to the power source(s)
3. Turn ON the power. NOTE: If a T1 Adaptor Unit is used, first turn ON the T1 Adaptor Unit power switch, then turn ON the Basic Unit power switch; this is necessary to inform the Basic Unit software that there is a T1 Adaptor in the Set.
4. Connect the line cables.

12.06 CABLE SELECTION AND CONNECTION, continued

Table 12-3
Cable/Panel Identification and Application

REF. FIG. = REFerence this FIGure for illustration of cable/panel

S = Cable Supplied with unit
C = Cable Connects to unit (supplied with mating unit)
O = Cable/Panel is Optional or supplied with mating Optional unit

MODEL	CABLE/PANEL DESCRIPTION	REF. FIG.	APPLICATION								
			BASIC			EXPANSION				T1 ADAPTOR	
			-1	-2	-D	-1	-2	-3	-4	-1	-2
36-0002	Panel Adaptor						O				
36-0003	Panel Adaptor	6-6		O							
36-0004	Panel Adaptor	8-7							O		
48-0001	Expansion	8-1	C	C	C	S	S	S	S		
48-0004	Loop Line	5-3	O			O		O			
48-0005	Loop Line	5-3	O			O		O			
48-0006	Loop Line	5-3	O			O		O			
48-0009	Audio Patch	4-1	S	S	S						
48-0011*	AC Power	3-1	S	S	S					S	S
48-0012	Univer. RS232	14-2	O	O	O						
48-0015	Chaining	14-8	O	O	O						
48-0018	Panel Adaptor	5-4,8-2	O			O					
48-0018-12	Panel Adaptor							O			
48-0020	E&M/Loop Line	8-6					O	O			
48-0021	E&M/Loop Line	8-6					O	O			
48-0022	E&M/Loop Line	8-6					O	O			
48-0039	E&M Line	6-5		O					O		
48-0040	E&M Line	6-5		O					O		
48-0041	E&M Line	6-5		O					O		
48-0043*	-48 Vdc Power	3-1	S	S	S		S	S		S	S
48-0047	T1 Line	7-2			O					O	O
48-0048	T1 Line	7-2			O					O	O
48-0056	T1 Adaptor	8-8	C	C						S	S(2)
48-0057	RS232 Plug	14-2	O	O	O						
48-0066	Cassette Power		O	O	O						
48-0067	Cassette		O	O	O						
48-0080	Loop Line	5-3	O			O		O			
48-0084	RS232 Cable	14-11	O	O	O						
48-0087**	AMP Cable	5-5	O			O					
48-0088**	AMP Cable	5-5	O			O					
48-0089**	AMP Cable	5-5	O			O					
48-0103	Panel Adaptor for AM1 PLUS 20/20. See Section 19,F.										

* Basic Units and T1 Adaptor Units are each supplied with one (1) power cord, according to the power source:

POWER SOURCE	POWER CABLE
115 Vac or 220 Vac	48-0011
-48 Vdc	48-0043

** Mates to 48-[illegible] Adaptor connector (Para. 5.08 & 8.03)

Table 12-4
Pin-Assignment/Wire-Color References for Connector(s)/Wires

KEY
F = Figure T = Table
REF. = REFerence indicated Figure (F) or Table (T) for list of pin assignments and/or wire colors of connector(s)/wires.
EXAMPLE: For 36-0003 Panel Adaptor, refer to Table 6-3 (T 6-3) for pin assignments and colors of wires.

MODEL	CABLE/PANEL DESCRIPTION	REF.	APPLICATION								
			BASIC			EXPANSION				T1 ADAPTOR	
			-1	-2	-D	-1	-2	-3	-4	-1	-2
36-0003	Panel Adaptor	T 6-3		X							
48-0004	Loop Line	T 5-1	X			X		X			
48-0005	Loop Line	T 5-1	X			X		X			
48-0006	Loop Line	T 5-1	X			X		X			
48-0012	Univer. RS232	F 14-2	X	X	X						
48-0018	Panel Adaptor	T 5-2	X			X					
48-0018-12	Panel Adaptor	T 8-3						X			
48-0020	E&M/Loop Line	T 8-2					X	X			
48-0021	E&M/Loop Line	T 8-2					X	X			
48-0022	E&M/Loop Line	T 8-2					X	X			
48-0039	E&M Line	T 6-2		X					X		
48-0040	E&M Line	T 6-2		X					X		
48-0041	E&M Line	T 6-2		X					X		
48-0043	-48 Vdc Power	F 3-1	X	X	X		X	X		X	X
48-0047	T1 Line	F 7-2			X					X	X
48-0048	T1 Line	F 7-2			X					X	X
48-0057	RS232 Plug	F 14-2	X	X	X						
48-0084	RS232 Cable	F 14-11	X	X	X						
48-0103	Panel Adaptor	T 19-1	For AM1 PLUS 20/20 Basic Unit.								

12.07 TYPICAL INTERCONNECTIONS BETWEEN AM1 PLUS UNITS

Four (4) examples are given below of how to mix and match AM1 PLUS units to achieve the desired configuration:

A. Full Set of 30 Dual Port Loop/Ground Start Lines
B. Set of 30 Dual-Port T1 Trunk Lines
C. Full Set of Analog Lines and Digital Trunks
D. Partial Set of Analog Lines and Digital Trunks

NOTE
For traffic considerations (calls per hour), see Para. 15.02.

A. Full Set of 30 Dual-Port Loop/Ground Start Lines: an AM1 PLUS-1 Basic Unit connected with an AM1E PLUS-1 Expansion Unit; see illustration in Fig. 12-9. This setup is for Line-to-Line testing with full 30-line capacity. Fig. 12-2 and Fig. 12-3 show Line-to-Line testing configurations with 10-line capacity.

This Set should be sufficient to adequately "load" a PBX or Central Office of 500 to 1000 lines. Chain together additional Sets to generate a greater load; see Para. 14.11 and Fig. 14-8.

12.07 TYPICAL INTERCONNECTIONS BETWEEN AM1 PLUS UNITS, continued

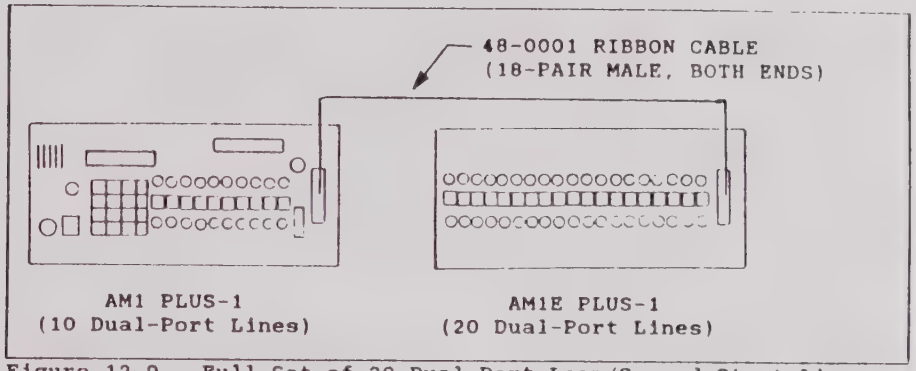


Figure 12-9. Full Set of 30 Dual-Port Loop/Ground Start Lines

B. Set of 30 Dual-Port T1 Trunk Lines: an AM1 PLUS-D Basic Unit, illustrated in Fig. 7-1. This setup is for Trunk-to-Trunk testing with full 30-line capacity. Fig. 12-5 shows a testing configuration.

This Set would normally be sufficient to test a switch with up to 1000 trunks. Additional AM1 PLUS-D Basic Units could be Chained together to test larger switches; see Para. 14.11 and Fig. 14-8.

C. Full Set of Analog Lines and Digital Trunks. A possible way of combining Analog and Digital lines in the same Set would be to connect a T1 Adaptor to the Set in Fig. 12-9; the result is shown in Fig. 12-10. Again, a total of 30 Originate Ports and 30 Terminate Ports can be programmed.

The calls may be any combination of:
- Line-to-Trunk
- Trunk-to-Line
- Line-to-Line
- Trunk-to-Trunk

D. Partial Set of Analog Lines and Digital Trunks. Another possible way of combining Analog and Digital lines in the same Set would be to connect an AM1E PLUS-1 (Analog) Expansion Unit to an AM1 PLUS-D (Digital) Basic Unit, shown in Fig. 12-11. This setup is for Line-to-Trunk/Trunk-to-Line testing; Fig. 12-4 shows a testing configuration.

This arrangement has a limit of 20 Analog lines. Therefore, a maximum of only 20 Line-to-Trunk or 20 Trunk-to-Line calls could be generated.

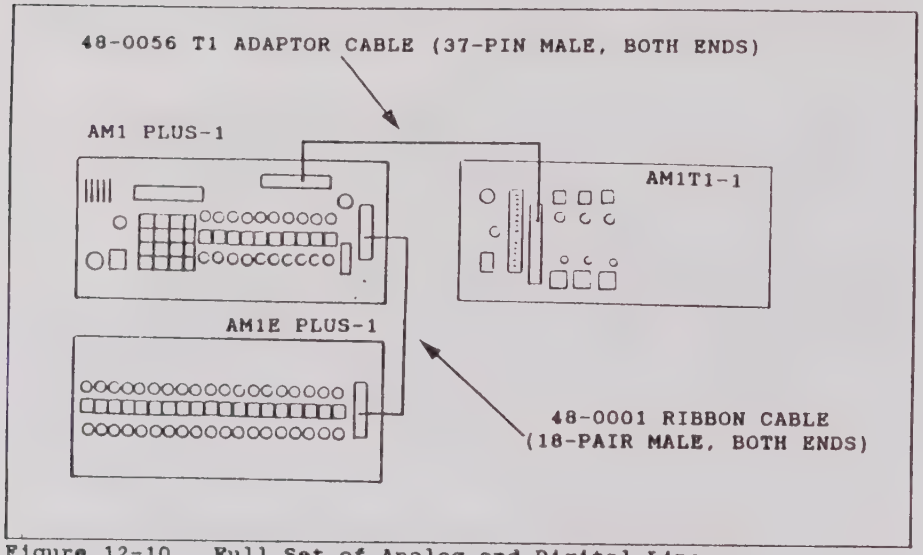


Figure 12-10. Full Set of Analog and Digital Lines

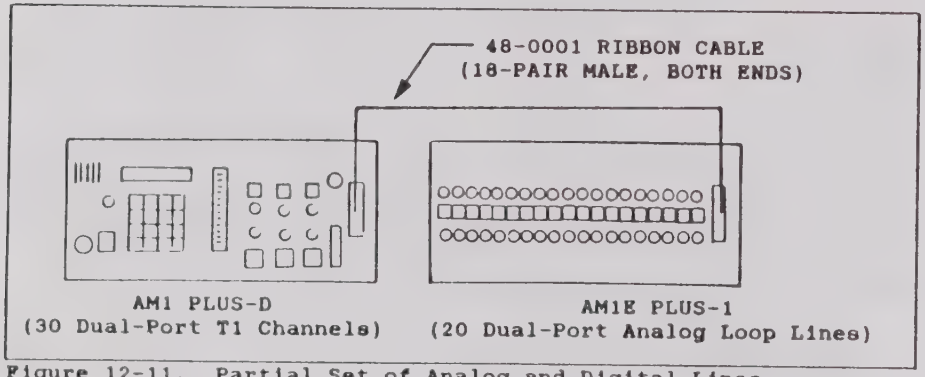


Figure 12-11. Partial Set of Analog and Digital Lines

12.08 T1/ANALOG APPLICATION NOTE

Concerning Sets which include a mixture of T1 and Analog lines, note the following:

A. All 30 dual-port Lines are programmable as T1 lines.
B. Depending on the setup, from 10 to 30 of the Lines can be programmed as Analog (loop/ground start or E&M).
C. Therefore, 10 to 30 of the Lines can be programmed as either T1 or Analog Lines.

12.08 T1/ANALOG APPLICATION NOTE, continued

NOTE

D. If a Port is programmed as a T1 channel, do not connect a line to the corresponding (Originate or Terminate) same-number Analog Port.

E. If an Originate Port were programmed for a T1 channel and a line were connected to the same-number Analog Originate Port, the Analog line would also be active (i.e. come off-hook the same time as the programmed T1 port), regardless of the position of the Analog Line enable switch; this would cause the switch to record extraneous false starts.

EXAMPLE:

Refer to the setup shown in Fig. 12-11. Lines 11 thru 30 can be programmed as either T1 channels or Analog loop/ ground start lines. In this example, ten lines are programmed as indicated below:

LINE	11	12	13	14	15	16	17	18	19	20
ORIGINATE PORT	A-11	A-12	A-13	A-14	A-15	B-01	B-03	B-05	B-07	B-09
TERMINATE PORT	B-02	B-04	B-06	B-08	B-10	A-16	A-17	A-18	A-19	A-20

Lines 11 thru 15 are Line-to-Trunk (unpaired).
Lines 16 thru 20 are Trunk-to-Line (paired).

Do not connect lines to Analog Terminate Ports 11 thru 15.
Do not connect lines to Analog Originate Ports 16 thru 20.

13. RUNNING TESTS AND INTERPRETING RESULTS

13.01 INTRODUCTION

This section covers the starting and stopping of tests, lists the steps that take place in the process of a typical call simulation and explains the results that are recorded in the Data Registers.

The paragraphs in this section are listed below:

13.02 Preparation Before Starting
13.03 Starting the AM1 PLUS
13.04 Call Sequence
13.05 Operations While AM1 PLUS is Running
13.06 Ending AM1 PLUS Testing: Finish and Stop
13.07 DATA REGISTERS
13.08 Number of Call Attempts
13.09 Average Dial Tone Arrival Time
13.10 Number of Delayed Dial Tones
13.11 Number of No Dial Tones
13.12 Number of No Rings on Terminate Port
13.13 Number of Confirmation Tone Failures
13.14 Average Post-Dial Delay
13.15 Number of Completed Calls
13.16 Run Time
13.17 Number of Terminations

13.02 PREPARATION BEFORE STARTING

Use the Check List below to prepare the AM1 PLUS for a test run:

1. Make Unit and Line Parameter settings per instructions in Sections 9 and 10.
2. Connect line cables to Basic Unit per Section 5, 6 or 7.
3. If have Expansion Unit and/or T1 Adaptor, connect cables per Para. 3.08.
4. If have RS232 port, connect printer and/or terminal per Para. 14.05 (for Automatic Hourly Data Printout and/or Real Time Error Reporting).
5. If chaining units, connect cables per Para. 14.11; all Sets operating in Synchronous Mode must be started (running) before calls will begin (Para. 14.12,B).
6. Connect line cables to switch under test per Para. 12.02.
7. Observe application notes in Section 15 as required.
8. Turn ON the lines to be tested with the Line Switches (Fig. 5-1, 6-1 or 7-1) or with the Line Enable parameter setting (Para. 10.02).

   NOTE

   If there is a mix of Analog and T1 lines, be sure to turn ON the Analog Originate Ports with the Analog Line (toggle) Switches, not the PORT ENABLE DIP switches of the AM1 PLUS-D or AM1T1.

9. To listen to activity on a line, connect Bantam cable from AUDIO MONITOR Jack to Originate or Terminate Port monitor jack of desired line. For more details, see Para. 13.05 under "Audio Monitor".

Mode Selection. The Mode of Operation or Call Generation Mode can be changed directly with the MODE command, instead of scrolling through the Unit Parameters to the corresponding prompt. See Para. 9.03 for Unit Parameter prompt and descriptions of the three (3) Operating Modes. See Para. 9.04 for Unit Parameter prompt and descriptions of the two (2) Call Generation Modes.

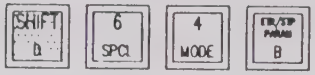
To toggle the Mode of Operation, use the MODE command:

MODE SELECT	
AM1 PLUS KEYBOARD	[D] [4] TERMINAL KEYBOARD

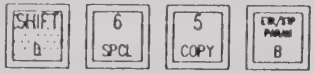
Each time the MODE command is executed, the Operating Mode will step (toggle) to another mode, as evidenced by the MODE LEDs changing state. Remember, the MODE LEDs are above and to the right of the display on an AM1 PLUS basic unit. Execute the MODE command as many times as necessary to reach the desired Operating Mode. The Call Generation Mode prompt will also appear (see Para. 9.04), so that it too can be changed if desired. After the desired mode is set, press [ETR/STP PARAM,B] to return to the last enabled line prompt.

Data Register Clear. To clear the Data Registers (Para. 13.07 thru 13.17), setting all counts to zero, use SPCL FUNCTION 4 or 5:

To clear all Data Registers, use SPCL FUNCTION 4:

SPECIAL FUNCTION 4, CLEAR ALL DATA REGISTERS	
 AM1 PLUS KEYBOARD	[D] [6] [4] [B] TERMINAL KEYBOARD

To clear the Data Registers of one (1) line, select the desired line per Para. 10.01, then use SPCL FUNCTION 5:

SPECIAL FUNCTION 5, CLEAR LINE DATA REGISTERS	
 AM1 PLUS KEYBOARD	[D] [6] [5] [B] TERMINAL KEYBOARD

NOTE

It is not necessary to clear the Data Registers before beginning a test. If desired, the test results in the Data Registers can be left to accumulate from one test run to another.

13.03 STARTING THE AM1 PLUS

The AM1 PLUS can be started manually or it can be programmed to start automatically to make one (1) or two (2) test runs.

Manual Start. To initiate a test run, use the START command:

START	
AM1 PLUS KEYBOARD	[D] [7] TERMINAL KEYBOARD

A. If in Auto Continue Mode, when START command is executed, Originate Ports of lines that are turned ON will come off-hook after the Start Delay (Para. 10.27) and generate traffic per programmed call scenarios (Parameter settings and Telephone Numbers).
B. If in Manual Mode, START command initiates next step in call sequence.
C. If Stopped in Stop-on-Trouble Mode, START command will cause the call to continue.

Automatic Start. To program the AM1 PLUS to automatically make one (1) or two (2) test runs, enter the desired start time(s) per the Unit Parameter explained in Para. 9.07. The AM1 PLUS will automatically start the test run(s) at the time(s) selected.

13.04 CALL SEQUENCE

The events that take place for a typical call sequence are listed below in Table 13-1. See Table 15-1 for the time taken for each step in the sequence. See Para. 15.11 for example call sequence.

Table 13-1
A Typical Call Sequence

1. Start Delay (optional) *
2. Originate Port off-hook
3. Wait for Start Dial signal (Dial Tone Fail time)
4. Dial Digits
5. Wait for Ring or Seizure on Terminate Port (Paired Mode)
6. Count Number of Rings at the Terminate Port
7. Terminate Port off-hook (Answer, Ring Trip)
8. Cut-Through Delay Time
9. Voicepath Confirmation Check **
10. Conversation Time (optional) ***
11. Originate and Terminate Ports both on-hook
12. Intercall Time or remaining Call-to-Call Time

* For Random Mode, Start Delay only delays the initial off-hook after the START command (Para. 10.27).
** If Answer Supervision is expected (Para. 10.14), checks are made after the Voicepath Confirmation Tone checks and just before on-hook.
*** If Conversation Time (Para. 10.26) is programmed, another Voicepath Confirmation Check is done just before the end of the Conversation Time.

13.04 CALL SEQUENCE, continued

Successful Calls. Each call proceeds per its programmed sequence and the COMPLETE (Completed Calls) register increments at the end of the call.

Failed Calls. In Automatic Continue Mode, a call will be aborted (both Originate and Terminate Ports go back on-hook) when any failure is encountered in the process of the call. Possible failures include:

- -No Dial Tone (before Dial Tone Fail time)
- -No Ring (at Terminate Port before Timeout time)
- -No Tone (incorrect or no Confirmation Tone, or expected 1004 Hz not received)
- -No Supervision (when Supervision expected)
- -60 IPM Busy or 120 IPM Busy call progress tones received

In Automatic Stop-on-Trouble Mode, a call will stop at the point in the sequence where a failure is found. The line stays off-hook to facilitate trouble shooting. If the trouble is with the voicepath confirmation check, a pulsed confirmation tone(s) will be sent continuously after the failure; this can be used as a tracer in trouble shooting. Lines without an error continue generating calls.

Test Results. These are recorded continuously in the Data Registers (Para. 13.07 thru Para. 13.17) while the AM1 PLUS is running. If the Automatic Hourly Data Printout (Para. 9.05) is enabled, a printout of all the Data Registers will be delivered to the RS232 port every hour on-the-hour, according to the Real Time Clock.

If the Real Time Error Report (Para. 9.06) is enabled, an error message will be delivered to the RS232 port at the time each error occurs. See Para. 14.08.

13.05 OPERATIONS WHILE AM1 PLUS IS RUNNING

NOTE
If the Operation Mode is changed while the unit is running, the AM1 PLUS will STOP.

Audio Monitor. While the AM1 PLUS is running, the Audio Monitor cord (plugged into the AUDIO MONITOR jack) can be moved from one monitor jack to another to listen to the events at the ports of different lines. For Analog lines, the monitoring points are labeled ORIGINATE (ORIG) and TERMINATE (TERM). For T1 lines, the monitoring points are labeled AUDIO. Remember for T1 trunks, the desired line is selected for monitoring by pressing the CHANNEL SELECT Buttons for that span until the desired line number (01 thru 24) appears in the windows.

See Fig. 4-1 which shows a typical Audio Monitor cord connection.

13.05 OPERATIONS WHILE AM1 PLUS IS RUNNING, continued

Audio Monitor, continued. Use the VOLUME control knob to adjust the audio level. Each part of a call scenario has a distinct type of sound, described below:

Sounds monitored at both Originate and Terminte Ports:
- -Off-Hook and On-Hook. A muffled click like a microphone being connected in a public address system.
- -Confirmation Tones. Two-way set of tones is a quick "bleep-bleep" sequence.

Sounds monitored at an Originate Port:
- -Dial Tone. A continuous tone.
- -Tone Dialing. A rapid series of tones.
- -Pulse Dialing. A clicking sound.
- -Ringback. The familiar sound of "ringing" when waiting for a called party to answer.

Sound monitored at a Terminate Port:
- -Ringing. A raspy "raw voltage" sound.

Data Register and Parameter Settings Review. While testing is in progress, the user can monitor the results by stepping through the Data Registers, at the end of the Line Parameter prompts for each line. The Unit and Line Parameter settings can also be reviewed. See Para. 13.07 thru Para. 13.17 for descriptions of the Data Registers.

Automatic Testing. The user need not be present for an automatic test run (Para. 9.07). One can run tests over the weekend or test customer lines at early morning hours, during low traffic, to minimize the possibility of interruptions in service.

Turning Line(s) ON/OFF. There are two (2) ways to control the ON/OFF condition of a line:

A. with the Line Switch or
B. with the Line Enable parameter setting (Para. 10.02).

To START an individual line while the AM1 PLUS is running:

A. Set the Line Switch to an ON position.

or

B. Set the Line Enable parameter to "1" (Line Switch must also be in an ON position).

To STOP an individual line while the AM1 PLUS is running:

A. Set the Line Switch to OFF.

or

B. Set the Line Enable parameter to "0".

NOTE

Line Switches and Line Enable parameters only affect the Originate Ports. Therefore, a programmed Terminate Port will always respond if the AM1 PLUS is running or in the FINISH mode, even if the Line Switch and/or Line Enable parameter for that line is OFF.

13.06 ENDING AM1 PLUS TESTING: FINISH AND STOP

A test run can be ended with either a FINISH or a STOP command. The FINISH command will stop each line when it finishes the call in progress and the STOP command will end the testing immediately.

To end testing when each line finishes the call in progress, use the FINISH command:

FINISH	
AM1 PLUS KEYBOARD	[D] [2] TERMINAL KEYBOARD

When the FINISH command is executed, each line will finish the call in progress, go on-hook and stay on-hook. The AM1 PLUS is in the FINISH Mode during the time between the execution of the FINISH command and the line going back on-hook. Unpaired Terminate Ports will answer calls in the FINISH Mode.

Automatic Finish. To program the AM1 PLUS to automatically finish one (1) or two (2) test runs, enter the desired finish time(s) per the Unit Parameter explained in Para. 9.07. The AM1 PLUS will automatically finish the test run(s) at the time(s) selected.

To end testing immediately, use the STOP command:

STOP	
AM1 PLUS KEYBOARD	[D] [9] TERMINAL KEYBOARD

When the STOP command is executed, all calls immediately abort, i.e. all Originate Ports and Terminate Ports go on-hook, and stay on-hook. Terminate Ports will not answer in Stopped Mode.

13.07 DATA REGISTERS

Data Registers keep a running count of different events that take place in the process of call generation. There is a set of Data Registers for each line. The Data Registers for each line appear after the last Line Parameter prompt (CONFIRM TRIES, Para. 10.29). See Fig. 4-3 or FOLDOUT for complete list of Data Register displays. Repeatedly press [ETR/STP PARAM,B] to scroll through the Data Registers.

The Data Registers are explained in Para. 13.08 thru Para. 13.17. See Para. 13.02 for instructions to clear Data Registers.

13.07 DATA REGISTERS, continued

NOTE

Because a Data Register is for recording test results, the user cannot make entries into a Data Register. Unlike other displays, Data Registers are not prompts for parameter settings. A flashing cursor is located to the left of the first digit of the number field, instead of a flashing first digit as in a parameter prompt.

The Run Time Data Register is in minutes. Two of the Data Registers calculate Averages, in seconds. The other Data Registers are counts which increment no more than once during a given call these Data Registers can count up to 65,535 after which the count will start again at 00000.

If the Automatic Hourly Data Printout (Para. 9.05) is enabled, the contents of the Data Registers will be printed out evey hour on-the-hour per the Real Time Clock.

Each call will either be successfully completed or will fail for one of four (4) different reasons. Since

A. a call will abort the instant an error is found and

B. each Data Register increments at most once per call,

the number of call Attempts for Paired Mode will be the same as the total of the Complete calls plus the total of all the Data Registers that record call failures. An example is given below:

EXAMPLE: Data Register Counts for a Test Run in Paired Mode

45123	Complete (calls)
00001	No Dial Tone (before Dial Tone Fail time)
00002	No Ring (at Terminate Port before Timeout time)
00001	No Tone (Confirmation Tone error or no Milliwatt)
+ 00001*	No Supervision (when Supervision expected)
45128	(Call) Attempts

* There is actually no Data Register to record the number of times calls failed because of No Supervision. But if any calls do fail because of No Supervision, the count can be calculated, knowing that the total must equal the number of Call Attempts. Also, a No Supervision failure is indicated with the Real Time Error Report, NO ANS SUPV; see Fig. 14-6 and Para. 14.08.12.

For Unpaired Mode, there is an additional Data Register (Para. 13.17) which records the number of seizures on the Terminate Port. The COMPLETE Data Register records the number of Originate Port call completions.

3.08 CALL ATTEMPTS

CALL PARAMETER/DATA DISPLAY

ATTEMPTS _00000;

Maximum count = 65535 (after which resets to 00000)

NOTE

This is the first Data Register. It follows the last Line Parameter prompt (Para. 10.29). Repeatedly press [ETR/STP PARAM,B] to scroll through the Data Registers.

The count in this Data Register is the number of call ATTEMPTS made from this Originate Port since the last reset.

3.09 AVERAGE DIAL TONE ARRIVAL TIME

CALL PARAMETER/DATA DISPLAY

AVG DT _000.0;

Units = seconds

This Data Register keeps a running average of the time taken for the Start Dial signal to be received by the Originate Port, counting from the time it comes off-hook. The Start Dial signal could be Dial Tone, a Wink or Delay Dial (drop of "M" lead); see Para. 10.07,A. This Data Register has no meaning if the line is programmed for "Immediate" Dial; see Para. 10.07,A,5.

The result (average) includes all start dial signal wait times, including all in the same call sequence, if there is more than one. The result is rounded off to the nearest tenth of a second; note the decimal point in the reading. Times waiting for Start Dial signals that are never received (NO DT) are not averaged in. The granularity of the raw data depends on the unit under test, as listed below:

UNIT	GRANULARITY OF START-DIAL SIGNAL ARRIVAL TIME
AM1 PLUS	± 50 ms (0.05 second)
AM1XT	± 1000 ms (1.00 second)
E&M Line, Wink Start	± 50 ms (0.05 second)
E&M Line, Dial Tone Start	± 1000 ms (1.00 second)

13.09 AVERAGE DIAL TONE ARRIVAL TIME, continued

NOTE

The Automatic Hourly Data Printout includes the average of the Dial Tone Arrival Times for all the lines (all raw data averaged together).

13.10 DELAYED DIAL TONES

CALL PARAMETER/DATA DISPLAY

DT DELAYS _00000;

Maximum count = 65535 (after which resets to 00000)

This Data Register records the number of times the Start Dial signal is received late (counting from the time the Originate Port comes off-hook) per the Dial Tone Delay Threshold, set per Para. 10.09. It will only increment once per call, even if more than one Start Dial signal is late within the same call.

The Start Dial signal could be Dial Tone, a Wink or Delay Dial (drop of "M" lead); see Para. 10.07,A. This Data Register has no meaning if the line is programmed for "Immediate" Dial; see Para. 10.07,A,5.

This register will also increment if a Start Dial signal is not received within the time set for the Dial Tone Fail parameter (at which time the call is aborted); see Para. 10.10.

The Real Time Error message is "SLOW DIAL TONE"; see Fig. 14-6 and Para. 14.08,1).

13.11 NO DIAL TONES

CALL PARAMETER/DATA DISPLAY

NO DT _00000;

Maximum count = 65535 (after which resets to 00000)

13.11 NO DIAL TONES, continued

This Data Register records the number of times that the Start Dial signal is not received within the Dial Tone Fail time set per Para. 10.10 (counting from the time the Originate Port comes off-hook). A call is aborted if this happens.

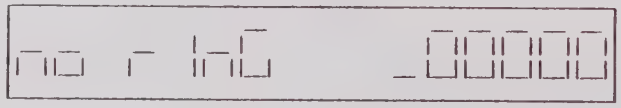
The Start Dial signal could be Dial Tone, a Wink or Delay Dial (drop of "M" lead); see Para. 10.07,A. This Data Register has no meaning if the line is programmed for "Immediate" Dial; see Para. 10.07,A,5.

The Real Time Error message for this failure is "NO DIAL TONE"; see Fig. 14-6 and Para. 14.08,2).

PAIRED MODE ONLY

13.12 NO RINGS ON TERMINATE PORTS

CALL PARAMETER/DATA DISPLAY



NO RING _00000;

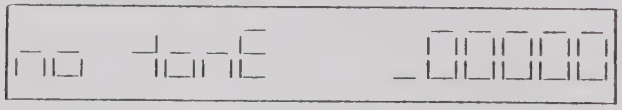
Maximum count = 65535 (after which resets to 00000)

This Data Register records the number of times that Ringing, or Seizure (for E&M or T1), is not detected by the Terminate Port when operating in Paired Mode. It will not increment when the line is in Unpaired Mode.

The Originate Port Timeout parameter (Para. 10.16) determines the time, from the last digit dialed, that the AM1 PLUS will wait for Ringing or Seizure at the Terminate Port before aborting the call and incrementing this register.

13.13 TONE FAILURES

CALL PARAMETER/DATA DISPLAY



NO TONE _00000;

Maximum count = 65535 (after which resets to 00000)

13.13 TONE FAILURES, continued

This Data Register records the number of calls aborted because of a Voicepath Confirmation Tone failure. A failure could be for either or both of the reasons listed below:

A. Incorrect frequency
B. Incorrect level

See Para. 15.10 for details with respect to Tone Failure analysis

Only one failure is recorded per call attempt (even if two-way voicepath check and/or Conversation Time were selected).

There are three (3) cases in which Voicepath Confirmation Tone are expected: Paired Mode Confirmation Tone(s), Para. 10.12 Unpaired Confirmation Tone(s), Para. 10.13; and a pause for Milli-watt Tone (with an "EE") in the Dialed Number Field, Para. 10.06 Real Time Error Reports (Para. 14.08) identify the type of tone failure.

13.14 AVERAGE POST-DIAL DELAY

CALL PARAMETER/DATA DISPLAY

AVG PD _000.0;

Units = seconds

This Data Register records the Average Post-Dial Delay time. Post-Dial Delay is the time from the last digit dialed until:

A. For Paired Mode, Ring or Seizure is detected at the Terminate Port or
B. For Unpaired Mode, Voicepath Confirmation Tone is detected by the Originate Port.

Averages are calculated for completed calls only.

NOTE
The Automatic Hourly Data Printout includes the average of the Post Dial Delay Times for all lines (all raw data averaged together).

13.15 COMPLETED CALLS

CALL PARAMETER/DATA DISPLAY

COMPLETE _00000;

Maximum count = 65535 (after which resets to 00000)

13.15 COMPLETED CALLS, continued

This Data Register will increment whenever the Originate Port successfully completes a call. See Para. 13.07 for an example with totals for the number of Complete Calls and the number of Call Attempts.

13.16 RUN TIME

CALL PARAMETER/DATA DISPLAY

RUN TIME _00000;

Maximum Time = 65535 minutes (after which resets to 00000)

This Data Register displays the total number of minutes that this line has generated traffic since the last reset. It can be left to accumulate the total run time for several tests.

NOTE

For Paired Mode, when [ETR/STP PARAM,B] is pressed with this display in view, the next display to appear will be first Line Parameter of the next line, shown in Para. 10.02.

UNPAIRED MODE ONLY

13.17 TERMINATIONS

CALL PARAMETER/DATA DISPLAY

TERM ONS _00000;

(TERMINATIONS)

Maximum count = 65535 (after which resets to 00000)

This Data Register records the number of Seizures or Rings on the Unpaired Terminate Port programmed for this line. This Data Register only appears if this line is programmed for Unpaired Mode; it does not appear for Paired Mode.

NOTE

When [ETR/STP PARAM,B] is pressed with this display in view, the next display to appear will be first Line Parameter of the next line, shown in Para. 10.02.

14. RS232 PORT OPERATION

14.01 INTRODUCTION

This section describes input and output functions of the RS232 port. The RS232 Port is an option and is ordered as an extra feature to any Basic Unit; see Para. 14.02 for the three (3) possible RS232 Port options.

The RS232 Port not only allows external control of the AM1 PLUS, but also makes possible additional functions and capabilities that cannot be done with an AM1 PLUS that is not equipped with an RS232 port.

The paragraphs in this section are listed below:

14.02 RS232 Optional Boards
14.03 General
14.04 Baud Rate, Parity and Stop Bit Select
14.05 RS232 Port Strapping and Connection
14.06 General Operation Notes

PRINTOUTS
14.07 Automatic Hourly Printout
14.08 Real Time Error Reports
14.09 Printouts on Command
A. Special Function 1: Printout of Both Selected Line Parameters and Data Registers
B. Special Function 2: Printout of All Parameters and Data Registers
C. Special Function 3: Printout of All Data Registers
D. Special Function D: Printout of Contents of EEPROM Memory
14.10 Miscellaneous Status Printouts

14.11 Chained Sets: Purpose and Installation
14.12 Chained Sets: Operation
14.13 Computer Downloading of Parameters
14.14 Remote Operation Through Modems
14.15 Optional 26-0016 Printer/Terminal with Printer Cable

14.02 RS232 OPTIONAL BOARDS

To order the RS232 Option, choose between three (3) different circuit board configurations. The numbers of the options are listed below.

A. Option 28-0005. RS232 Port and Cassette Interface Card. Concerning the Cassette Interface, see item 1 in Fig. 4-1 and Para. 11.08.
B. Option 28-0006. RS232 Port Interface Card.
C. Option 28-0079. RS232 Port Interface Card (with prompt-programmed Baud rate and Parity).

Options 28-0005 and 28-0006 have a DIP switch to set Stop Bits, Parity Enable, Parity and Baud Rate (110, 300, 600, 1200, or 2400). The front panel of the AM1 PLUS must be removed to access the DIP switch on these circuit boards. See Fig. 14-1 for DIP switch settings. See Appendix D for front panel removal and location of circuit board.

With Option 28-0079, Unit Parameters prompts are used to set Baud Rate (300, 1200, 2400, 4800 and 9600) and Parity; see Para. 9.14 and Para. 9.15. Only this option has 4800 and 9600 Baud Rates.

NOTE

A big advantage of the 28-0079 Option over the other RS232 options is the convenience of changing the Baud Rate and Parity settings without removing the front panel and RS232 Port circuit card.

14.03 GENERAL

The RS232 Port is labeled "AUX" (AUXiliary) on the front panel of an AM1 PLUS basic unit; it is item 4 in Fig. 4-1.

Terminology. Definitions of words used in this section:

- -Chaining: Connecting together of two (2) or more AM1 PLUS sets (up to 15) to increase the number of lines over which calls can be simultaneously generated.
- -CRT: Cathode Ray Tube, i.e. a Monitor screen
- -External: Describing a device outside of the AM1 PLUS.
- -Global: Refers to a command that can be sent simultaneously to all sets in an AM1 PLUS chain.
- -Local: In the same location as the AM1 PLUS.
- -Printout: Information output by the AM1 PLUS that can be recorded as a hard copy with a printer or viewed on a CRT.
- -Remote: In a different location than the AM1 PLUS, connected to the AM1 PLUS through modems over a network.
- -Set: The maximum of 30 dual-port lines that can be controlled from any Basic Unit. AM1 PLUS-1 and -2 Basic Units each require an Expansion Unit to bring the total capacity up to 30 lines, whereas an AM1 PLUS-D Basic Unit is a full Set in itself with self-contained 30-line capacity.
- -Terminal: A device from which commands can be sent to as well as received from an AM1 PLUS.

Purpose. The RS232 Port is used to

A. Manually control the AM1 PLUS from an external terminal.
B. Computer download parameter settings.
C. Deliver printouts to a monitor (CRT) and/or printer.
D. Chain together up to 15 AM1 PLUS sets.
E. Operate the AM1 PLUS from a remote location using modems.

Operation. See the paragraphs listed in Para. 14.01 for the RS232 Port input/output functions. Note that one (1) or more AM1 PLUS sets can be controlled externally through the RS232 Port either manually or by computer download, either locally or from a remote location. There are a variety of outputs in the form of "printouts". Operation uses serial asynchronous ASCII code.

Connections. Possible connections to the RS232 Port include:

A. Data Terminal Equipment (DTE): Teleprinter, CRT, Computer
B. Printer
C. Chaining Cable (48-0015) to connect multiple AM1 PLUS sets
D. Modem

14.04 BAUD RATE, PARITY AND STOP BIT SELECT

There may be an upper limit on the Baud Rate because of the setup. Use Table 14-1 as a guide in setting the Baud Rate.

Table 14-1
Baud Rate Selection Guide

SETUP	ALLOWABLE BAUD RATES
One (1) AM1 PLUS set manually controlled from a Terminal	All Baud Rates
One (1) AM1 PLUS set controlled with on-board keyboard/display using external CRT or read-only printer	All Baud Rates
One (1) AM1 PLUS set receiving computer Download programmed to wait for echoed character before sending next character	All Baud Rates
One (1) AM1 PLUS set receiving computer Download programmed to just dump information (without waiting for echoed characters)	No higher than 2400 Baud
Two (2) or more AM1 PLUS sets Chained together	No higher than 2400 Baud

The way to set the RS232 Baud Rate, Parity and Stop Bits depends on the RS232 option. Instructions are given below:

Option 28-0079. Only Baud Rate and Parity are set; these are set with Unit Parameter prompts as explained in Para. 9.14 and 9.15. Possible Baud Rates are 300, 1200, 2400, 4800 and 9600.

Options 28-0005 and 28-0006

1. Be sure power is OFF.
2. Remove the front panel of the AM1 PLUS and remove the RS232 printed circuit board. See Appendix D for instructions.
3. Locate the DIP switch on the printed circuit board.
4. Set the DIP switches per Fig. 14-1. Possible Baud Rates are 110, 300, 600, 1200 and 2400.

NOTE

The factory ("normal") settings are:
-2 Stop Bits
-Parity Enabled
-Even Parity
-300 Baud

5. Re-install printed circuit board, front panel and power cord.

14.04 BAUD RATE, PARITY AND STOP BIT SELECT, continued

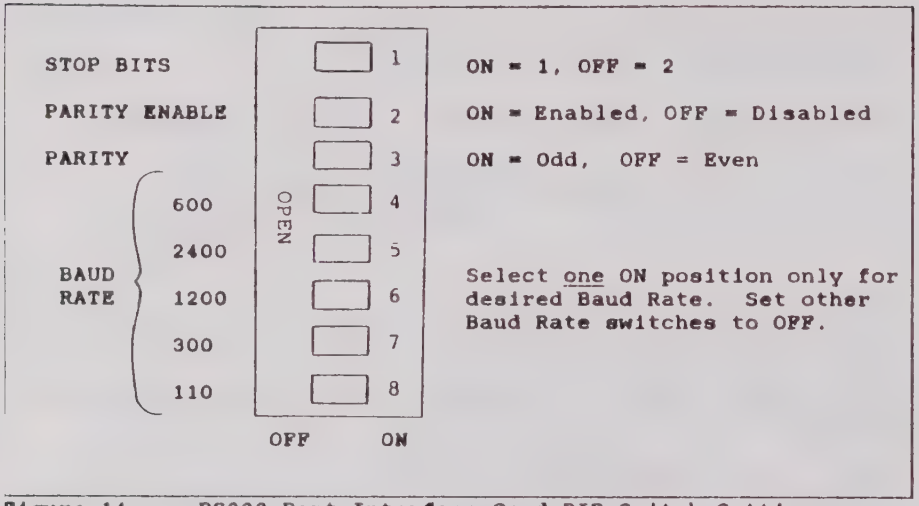


Figure 14-1. RS232 Port Interface Card DIP Switch Settings

14.05 RS232 PORT STRAPPING AND CONNECTION

RS232 Port Connector. This is a 25-pin D-type male connector, located in the lower right hand corner of the front panel of a Basic Unit and labeled "AUX" (AUXiliary connector). This is item 4 in Fig. 4-1.

Strapping. As a rule, certain RS232 Port pins need to be strapped, even if no external device is connected to the RS232 Port. If the required pins are not strapped, the Synchronous Mode of call origination will not operate.

NOTE

For AM1 PLUS sets in a chain, only the RS232 Port pins of the first Set in the chain are strapped; see Para. 14.11.

Ameritec provides two (2) ways to do the RS232 port strapping:

A. The connector of the Universal RS232 Port Cable (48-0012) or the Printer Cable (48-0084) contains the strapping.
B. If neither cable listed in "A" above is ordered with a Basic Unit, an RS232 Terminating Plug (48-0057), female, is provided.

The Universal RS232 Port Cable and the Terminating Plug are illustrated in Fig. 14-2. The Printer Cable is described in Para. 14.15 and illustrated in Fig. 14-11.

NOTE

If none of the connectors listed above is available, use a female 25-pin D-type connector and connect straps (jumpers) per Terminating Plug drawing in Fig. 14-2.

14.05 RS232 PORT STRAPPING AND CONNECTION, continued

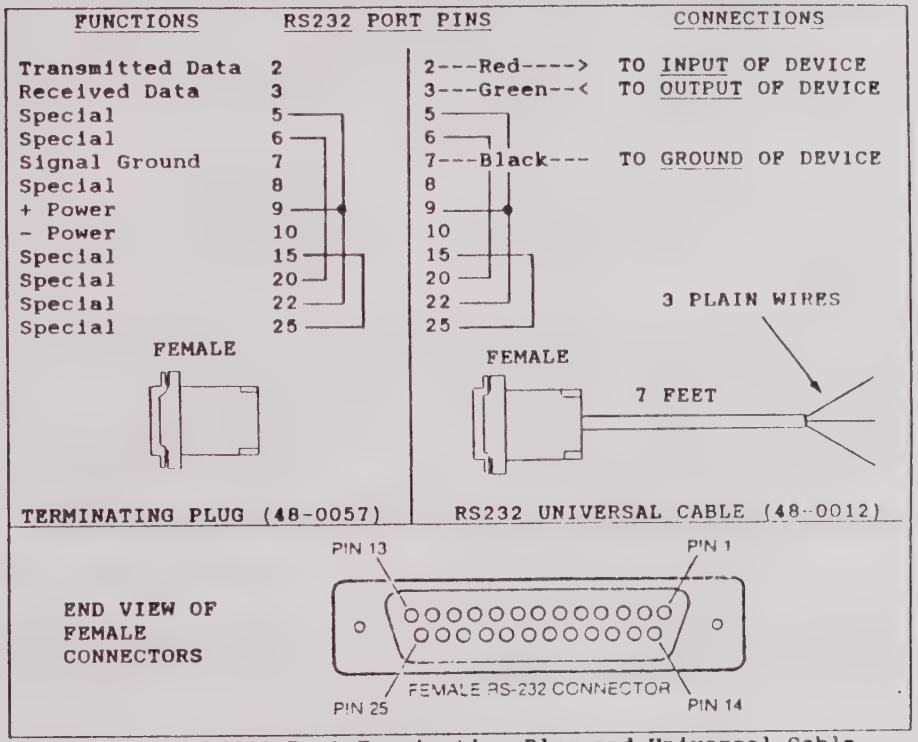


Figure 14-2. RS232 Port Terminating Plug and Universal Cable

Universal RS232 Port Cable (48-0012). This cable (shown in Fig. 14-2) can be used to connect most external devices (printer, CRT, data terminal, modem or teleprinter) to the RS232 Port of an AM1 PLUS Basic Unit. Because of the variety of connectors of the devices that can be connected to the RS232 port, the connecting wires of the cable are plain, ready to attach the matching connector, compatible with the device. Note the following:

A. Pins 5, 9, and 22 must be jumpered to enable the synchronous mode of operation.
B. In addition to the strapping on the AM1 PLUS side of the cable, it may be necessary to jumper certain pins on the connector of the device for proper operation of the printer or data terminal. Consult the instruction manual of the device being used.

14.06 GENERAL OPERATION NOTES

Instructions are given here for local RS232 Port operation (serial, asynchronous ASCII) of one (1) AM1 PLUS set. See Para. 14.12 for operation of Chained Sets, Para. 14.13 for Computer Downloading and Para. 14.14 for Remote Operation; there are many possible combinations of the basic configurations; for example, a Remote Computer could Download parameters to Chained Sets.

Setup for Local Operation.

1. Set the Baud Rate and Parity to be compatible with the device being connected; see instructions in Para. 14.04.
2. Strap pins on the device if necessary for operation per instruction manual of device.
3. Connect the device to the RS232 Port (AUX) using the 48-0012 Universal Cable or 48-0084 Printer Cable as shown in Fig. 14-3.

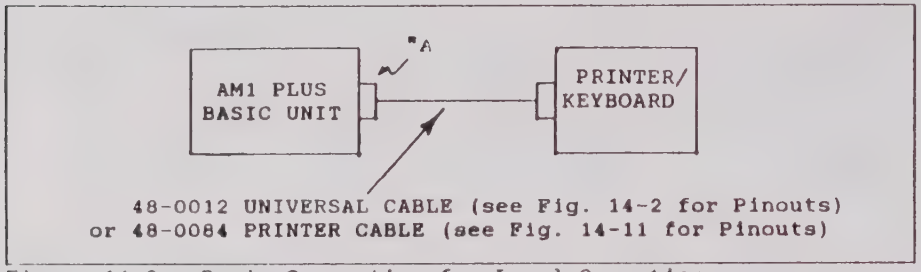


Figure 14-3. Basic Connection for Local Operation

Setting Parameters. There are two (2) ways to set Parameters through the RS232 port:

A. Manually, using a Terminal keyboard
B. Automatically, using a computer to Download information

The manual method is described in (this) paragraph 14.06; see Para. 14.13 for Computer Downloading.

Terminal Keyboard. A Terminal Keyboard is used in much the same way as the keyboard on the AM1 PLUS to set parameters, request printouts and perform special functions.

NOTES

-The user should become very familiar with operation using the AM1 PLUS keyboard/ display before attempting RS232 Port operation; see Para. 4.05 and Para. 4.11.
-As a rule, set [CAPS LOCK] or [ALPHA LOCK] on the terminal keyboard for all operations with the AM1 PLUS (see Table 14-2 for some exceptions).

Primary (Black) Functions. There are 16 keys on a terminal keyboard that are used for the primary functions (see Para. 4.05 under "primary functions"). The 16 primary function terminal keys correspond to the keys on the AM1 PLUS. These keys are listed in a table and shown circled in the illustration of an AM1 PLUS keyboard in Fig. 14-4.

Secondary (Red) Functions. To access a secondary function using a terminal keyboard:

1. press [D]
2. press the corresponding primary function key (see drawing in Fig. 14-4).

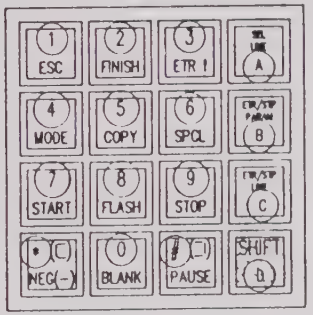
14.06 GENERAL OPERATION NOTES, continued

PRIMARY FUNCTIONS

AM1 PLUS FUNCTION	EQUIVALENT TERMINAL KEY (circled in drawing below)
[0] thru [9]	[0] thru [9]
[SEL LINE]	[A]
[ETR/STP PARAM]	[B]
[ETR/STP LINE]	[C]
[SHIFT]	[D]
[* ([ )]	[*]
[# (])]	[#]

CIRCLED CHARACTERS REPRESENT TERMINAL KEYS FOR PRIMARY FUNCTIONS

PROGRAM KEYBOARD



NOTES

-The [*] and [#] keys on a terminal are shift functions. Press the shift on the terminal keyboard before pressing these keys.
-[A], [B], [C] and [D] terminal keys listed above are upper case (capital) letters.

Figure 14-4. Primary Function Terminal Keys

EXAMPLES: To execute the START function, press [D][7] ("START" will be printed out as an acknowledgement; see Para. 14.10,B).

To access the COPY line parameter prompt, press [D][5].

To write the letter "A", press [D][A] (just pressing [A] is the SELECT LINE function); see Table 14-2 for alternate keystrokes for letters.

Alternate Keystrokes. As a convenience, some characters that normally require two (2) keystrokes may be directly entered from the terminal keyboard. Table 14-2 lists terminal keyboard single keystroke functions (keyboard shift and CAPS LOCK not considered a keystroke).

Table 14-2
Single Keystroke Terminal Keyboard Functions

AM1 PLUS FUNCTION	TERMINAL KEY
NEG (-)	[-]
BLANK	[Space Bar]
PAUSE	[P]
FLASH	[F]
A	[a]
B	[b]
C	[c]
D	[d]
ESC (Escape)	[E]
ETR ↑	[↑]

Prompts. When parameters are being set/reviewed, the same prompts that appear on the 16-character AM1 PLUS display are output to the Terminal Printer/Monitor(CRT). Each Printout/CRT prompt is followed by a semicolon, ";", indicating that the AM1 PLUS is ready to receive a parameter entry. Once the correct number of characters have been entered for the parameter value, another ";" will be output, indicating the end of the parameter entry. After writing a new parameter value, press [B] (or [C]) to enter the new value into RAM.

NOTE
The RS232 Port Unit and Line Parameter prompts are given in Sections 9 and 10, written under the illustration of the respective AM1 PLUS display prompt.

EXAMPLE: A sample dialogue between an operator and an AM1 PLUS-D is listed below. In this example, some Line Parameters are set for Line 5. Note the following points:

A. Section 10 explains each of the Line Parameter prompts.
B. In the "DIALOGUE", the characters automatically output by the AM1 PLUS are not underlined; the characters input by the operator are underlined.
C. The AM1 PLUS echos the characters input by the operator, except the (upper case) letters "A", "B", "C" and "D" (see Fig. 14-4 for functions for these letters).
D. In the selection of the T1 Span, "b" (lower case) is written instead of "DB" and "d" (lower case) is written instead of "DD"; see Table 14-2.

DIALOGUE		COMMENTS
A		
LINE	01;05;B	Line 05 selected
ON=1 OFF=0	1;B	Originate Port left enabled ("ON")
ORIG PORT	A:01;b:09;B	T1 span "B", channel "9" selected
TERM PORT	A:01;d:14;B	T1 span "D", channel "14" selected
	;9630334B	Telephone number 9630334 entered
DT DELAY	03;05;B	Dial Tone Delay threshold set to 5 sec
DT FAIL	15;20;B	Dial Tone Fail threshold set to 20 sec
PR=1 UNPR=2	1;B	Paired operation selected

14.06 GENERAL OPERATION NOTES, continued

EXAMPLE, continued:

DIALOGUE	COMMENTS
CONF TONE 12;B	Tone "1", 2-way voicepath confirmation
SUP CH 1=N 2=Y 1;B	No supervision check required
1 D-W 00000-0000;B	Answer when Terminate Port is seized
TIMEOUT-RNG 10:1;15:1;B	Call failure timeout changed to 15 sec
INTERCALL 03;08;B	Intercall time changed to 8 seconds
CALL-TO-CALL 0000;0010;B	Call-to-call time set at 10 seconds
TT=1 DP=2 MF=3 1;B	Touch Tone dialing
LO FRE 00;D*25;B	Low Freq offset by -2.5% (D* = "-")
HI FRE 00;D010;B	High Freq offset by +10% (D0 = blank)
LO HI DB :06:06;12:18;B	Low Freq outpulsed at -12 dB. High Freq outpulsed at -18 dB.
ON-OFF TIME 60:60;40:50;C	ON/OFF timing set to 40ms ON, 50ms OFF.
LINE 06	Parameter entered and step to same parameter of next line (Line 6).
ON-OFF TIME 60:60;	ON/OFF Time prompt for Line 6.

Special Commands. There are some special commands that can only be made through the RS232 port. These are listed in Table 14-3.

Table 14-3
Special RS232 Commands

COMMAND	FUNCTION
$<	Causes the selected line to go off-hook (only if AM1 unit is stopped)
$>	Causes the selected line to go on-hook (only if AM1 unit is stopped)

14.07 AUTOMATIC HOURLY PRINTOUT

The Unit Parameter prompt to enable/disable the Automatic Hourly Printout is described in Para. 9.05. A printer or CRT must be connected to the RS232 Port to record the hourly (on the hour) report. This printout contains a copy of all the data registers.

NOTES

- There are two (2) types of Automatic Hourly Printouts: a 10-line printout (see Fig. 14-5) and a 30-line printout (see Fig. 14-9).
- When an Expansion Unit or T1 Adaptor is connected, at least one of the line enable switches from Line 11 thru 30 must be ON to include Lines 11 thru 30 in the printout.
- With the Hourly Automatic Printout enabled and the power ON, the printout will be delivered each hour, even if the AM1 PLUS is stopped.

A sample Automatic Hourly Report is shown in Fig. 14-5

```
DATA READOUT 08:00 04/06/88
CUM RUN TIME:  00033
LINE    ATT   AVGDT  DTDLY   NODT  NORNG  NOTON  AVGPD  COMPL  RTIME
 01    00063  001.1  00000  00000  00000  00000  000.2  00063  00008
 02    00009  002.0  00000  00000  00000  00000  000.2  00009  00001
 03    00000  -----  00000  00000  00000  00000  -----  00000  00000
 04    00000  -----  00000  00000  00000  00000  -----  00000  00000
 05    00159  000.2  00000  00000  00000  00000  000.2  00159  00015
 06    00000  -----  00000  00000  00000  00000  -----  00000  00000
 07    00000  -----  00000  00000  00000  00000  -----  00000  00000
 08    00000  -----  00000  00000  00000  00000  -----  00000  00000
 09    00000  -----  00000  00000  00000  00000  -----  00000  00000
 10    00000  -----  00000  00000  00000  00000  -----  00000  00000
TOTL 000231 0000.5 000000 000000 000000 000000 0000.2 000231

CALL TERMINATION REGISTERS
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
TOTAL: 000000
```

Figure 14-5. Sample Automatic Hourly Printout (AM1 PLUS Basic)

Explanation of Fig. 14-5 Printout. Note that only Line 01 (8 min.), Line 02 (1 min.) and Line 5 (15 min.) were enabled since the last reset. Definitions of the abbreviations are listed below. See Para. 13.08 thru Para. 13.17 for more details.

CUM RUN TIME (minutes) — acCUMulated RUN TIME of the AM1 PLUS unit since the last data register reset. Note that this is not the total of the run times of the individual lines. Lines 3, 4, and 6 thru 10 were continuously OFF during this time, as indicated by the dashed lines in the AVGDT and AVGDP columns.

ATT — number of call ATTempts

AVGDT — AVeraGe time for Start Dial Signal(s), e.g. Dial Tone, to be sensed by the Originate Port. See Para. 13.09 for granularity of data. If there is more than one (1) Start Dial Signal per call, all the arrival times are included in the average.

DTDLY — Dial Tone DeLaYs. Number of times start dial signal is received late per Dial Tone Delay threshold (Para. 10.09).

NODT — NO Dial Tones. Number of times no Start Dial signal was received.

NORNG — NO RiNG. Number of times Ringing or Seizure not detected by Terminate Port. (Paired Mode Only)

14.07 AUTOMATIC HOURLY PRINTOUT, continued

Explanation of Fig. 14-5 Printout, continued

NOTON — NO TONe. Number of times expected Voicepath Confirmation Tones not received.

AVGPD — AVeraGe Post-Dial delay (for completed calls only). See Para. 13.14 for definition.

COMPL — COMPLeted calls.

RTIME — Run TIME. Run time for this line (i.e., AM1 PLUS running with this line enabled).

TOTL — TOTaLs. Except for the two (2) "AVG" columns, these are the totals of all the respective registers for the individual lines. In the case of the "AVG" columns, the figure in the TOTL line is the weighted average for the calls on all the lines. The calculations below use the information from Fig. 14-5.

ATTEMPTS:	63	COMPLETIONS:	63
	9		9
	159		159
TOTAL	231	TOTAL	231

Calculation of Weighted Average of Time to Receive Start Dial Signal ("TOTL" AVGDT):

$$\frac{63(1.1) + 9\ (2.0) + 159\ (0.2)}{63 + 9 + 159} = \frac{69.3 + 18.0 + 31.8}{231}$$

$$= \frac{119.1}{231}$$

$$= 0.5 \text{ sec AVGDT}$$

NOTES

-The calculations above are not really how the AM1 PLUS calculates the weighted average. The raw data for each of the individual lines is used to calculate the recorded average for each line (rounded off to the nearest tenth of a second). The AM1 PLUS uses all the raw data to calculate the weighted average, not the rounded off averages for each line; this result is then rounded off to the nearest tenth of a second. Therefore, using the method shown above to "confirm" the weighted average reading may not show agreement because of the greater accuracy of the AM1 PLUS using raw data that is not rounded off.

-The weighted average is not a straight average of averages for the individual lines, which would be:

$$\frac{1.1 + 2.0 + 0.2}{3} = \frac{3.3}{3} = 1.1 \text{ sec}$$

Explanation of Fig. 14-5 Printout, continued

CALL TERMINATION REGISTERS — For Unpaired Mode only, numbers indicate the number of seizures on the Terminate Port programmed for the respective line. The three (3) rows of figures are for:

First Row: Lines 1 thru 10
Second Row: Lines 11 thru 20
Third Row: Lines 21 thru 30

All registers will be 00000 for Paired Mode.

14.08 REAL TIME ERROR REPORTS

NOTE

Real Time Error Reports are only available through the RS232 Port -- they do not appear on the AM1 PLUS LED display.

Definition and Content. A Real Time Error Report is a single line of information that identifies a failure which occurs when the AM1 PLUS is running. The following information is contained in each Real Time Error Report:

A. The number of the Line (01 thru 30) where the error occurred; if the Set is part of a Chain, the Address letter (Para. 14.12,A) appears before the Line number.
B. Identification of the failure
C. The time of day and date the error occurred (per the Real Time Clock), even though the report may be output some time later (see "When Output" below).

The command to enable/disable the Real Time Error Report is a Unit Parameter (Line 00); see Para. 9.06.

NOTE

Disable the Real Time Error Report if a printer/CRT is not connected to the RS232 Port or is not functional (OFF or off-line). If the Real Time Error Report were enabled with the printer/CRT disconnected, the error messages would be queued in a buffer; if this buffer filled up, the next real time error on each line would cause that line to stop until the buffer were emptied.

When Output:

A. Generally, the Real Time Error Report is delivered to the printer/CRT through the RS232 Port immediately after the error occurs. If there is a burst of errors, however, the error reports are queued in a buffer and output as quickly as the printer/CRT can print out the messages.
B. If the parameter settings were being reviewed with the AM1 PLUS running, and an error occurred, the Real Time Error Report would be printed at the first pause (>5 sec) of terminal keystroke activity.
C. If an error(s) occurs during another printout (for example, the Automatic Hourly Data Printout), the error message(s) is stored in a buffer and printed out after the other printout.

14.08 REAL TIME ERROR REPORTS, continued

Types. There are 12 types of Real Time Error Reports. A sample of each type is given in Fig. 14-6.

```
1)LINE A02 SLOW DIAL TONE    @ 15:07 04/06/88*
2)LINE B05 NO DIAL TONE      @ 16:17 04/06/88 DIGIT=000*
3)LINE 01 60 IPM BUSY        @ 16:30 04/06/88
4)LINE 07 120 IPM BUSY       @ 17:00 04/06/88
5)LINE C24 NO RING           @ 08:07 04/07/88*
6)LINE 16 NO CONF TONE 1B    @ 09:12 04/07/88 (LEVEL)
7)LINE 09 NO CONF TONE 2B    @ 10:51 04/07/88 DIGIT=017 (FREQUENCY)
8)LINE 30 NO CONF TONE 1E    @ 11:21 04/07/88 (FREQUENCY)
9)LINE 04 NO CONF TONE 2E    @ 13:01 04/07/88 (FREQUENCY)
10)LINE 08 3 CONF TRIES RQD  @ 13:07 04/07/88
11)LINE 01 NO TONE           @ 14:43 04/07/88 DIGIT=011 (LEVEL)
12)LINE 01 NO ANS SUPV       @ 16:37 04/07/88

  * From Chained Unit; note Address Letter before Line Number.
```

Figure 14-6. Sample Real Time Error Reports

Descriptions. Numbering of the explanations which follow corresponds to numbering of the Real Time Error Reports in Fig. 14-6:

1) SLOW DIAL TONE. The expected Start Dial Signal (Dial Tone or Wink) arrived later than the Dial Tone Delay threshold set in Para. 10.09. This is not cause for a call failure. The "DT DELAYS" Data Register (explained in Para. 13.10) is incremented (maximum once per call) for each slow Start Dial Signal.

   NOTE

   The numbering (001 thru 128) of the possible 128 digits of the Dialed Number Field is shown at the beginning of Para. 10.06. If a Digit Pointer, DIGIT=XXX, appears at the end of a Real Time Error Report, it identifies where an error occurred within the Dialed Number Field sequence. For example, DIGIT = 057 is about half way in the 4th Dialed Number Field.

2) NO DIAL TONE. The Start Dial Signal (Dial Tone or Wink) was not received within the Dial Tone Fail threshold (Para. 10.10). The call is aborted when this happens. If the Start Dial Signal is within the Dialed Number Field -- "P" (pause for Dial Tone) or "Ec" (pause for Wink) -- the location within the Dialed Number Field where Dial Tone was not detected will be indicated with the Digit Pointer, DIGIT=XXX. (See NOTE above.) The No Dial Tones Data Register (explained in Para. 13.11) is incremented for each Start Dial Signal not received.

3) 60 IPM BUSY. 60 Impulse Per Minute (IPM) Busy Signal received. This is also known as a "Slow Busy" or "Line Busy" signal, indicating that the line of the subscriber called was off-hook at the time of the call attempt. The call is aborted when this happens. The No Rings on Terminate Ports Data Register (Para. 13.12), Paired Mode, or No Tone Data Register (Para. 13.13), Unpaired Mode, is incremented.

Descriptions, continued:

4) 120 IPM BUSY. 120 Impulse Per Minute (IPM) Busy Signal received. This is also known as a "Fast Busy" or "Reorder" signal, indicating that all possible call paths through the switch were busy at the time of the call attempt. The call is aborted when this happens. The No Rings on Terminate Ports Data Register (Para. 13.12), Paired Mode, or No Tone Data Register (Para. 13.13), Unpaired Mode, is incremented.

5) NO RING. No Ring or Seizure was detected at the Terminate Port (Paired Mode only). The call is aborted and the "NO RING" Data Register is incremented.

PAIRED MODE ONLY

Real Time Error Reports (6), (7), (8) and (9) record failure of Voicepath Confirmation Check in Paired Mode. Refer to the call sequence and the NOTE listed in Para. 10.26 for explanation of the codes "1B", "2B", "1E" and "2E". "1E" and "2E" only apply when Conversation Time is programmed. Reports (6), (7), (8) and (9) will only be output if there is a failure on the last allowable try (per Para. 10.29 parameter); the call is aborted and the "NO TONE" Data Register is incremented whenever any of these possible failures occurs. Real Time Error Report (10), however, is only a warning that more than one try was required for a successful voicepath confirmation.

6) NO CONF TONE 1B. First Beginning Confirmation Tone not correctly received within the number of allowable attempts (as programmed by parameter of Para. 10.29).

7) NO CONF TONE 2B. Second Beginning Confirmation Tone not correctly received within the number of allowable attempts (as programmed by parameter of Para. 10.29).

8) NO CONF TONE 1E. First Ending Confirmation Tone not correctly received within the number of allowable attempts (as programmed by parameter of Para. 10.29).

9) NO CONF TONE 2E. Second Ending Confirmation Tone not correctly received within the number of allowable attempts (as programmed by parameter of Para. 10.29).

NOTE

"(FREQUENCY)" or "(LEVEL)" indicate the reason for the tone failure; see Para. 15.10 for details.

10) X CONF TRIES RQD (Paired Mode Only). Number of Tries (X = 2 to 9) Required (RQD) to send a Confirmation Tone before a successful voicepath confirmation could be made (per allowable tries set with Para. 10.29 parameter). Even though the call may be scored as complete (if all other voicepath confirmations are also successful), this serves as a warning that a voicepath was not confirmed on the first attempt.

14.08 REAL TIME ERROR REPORTS, continued

Descriptions, continued:

11) NO TONE. An expected Voicepath Confirmation Tone was not received. The "NO TONE" Data Register is incremented. The Tone could be:
   A. In Unpaired Mode, a programmed Tone expected by the Originate Port (per setting of Para. 10.13)
   B. In the Dialed Number Field sequence, the Tone expected because of an "F" (look for Confirmation Tone) or an "FF" (look for 1000 Hz, milliWatt). For this case, the Digit Pointer (DIGIT = XXX) indicates where the failure occurred in the Dialed Number Field.

12) NO ANS SUPV. An expected Answer Supervision (ANS SUPV) not received. See Para. 10.14 for definition of Answer Supervision and when test for Answer Supervision is made. There is no Data Register to record this failure.

14.09 PRINTOUTS ON COMMAND

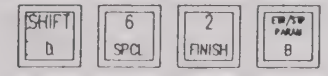
There are four (4) printouts that can be output on command by the operator. Each of these printouts is executed using a SPECIAL FUNCTION. The printouts with Special Functions 1, 2 and 3 are output from the RAM (active settings). See Sections 9 and 10 for explanations of Unit and Line Parameters; see Para. 13.07 thru 13.17 concerning Data Registers.

A. SPECIAL FUNCTION 1. Print Parameters and Data Registers of Selected Line Only.
   1. Press [SEL LINE,A]
   2. Enter "00" for Unit Parameters or "01" thru "30" for desired Line Parameters
   3. Press [B]
   4. Press keys as indicated below for printout:

SPECIAL FUNCTION 1	
AM1 PLUS KEYBOARD	[D] [6] [1] [B] TERMINAL KEYBOARD

   Sample printouts are shown in Fig. 14-7.

B. SPECIAL FUNCTION 2. Print Parameters and Data Registers of All Lines.
   A sample printout for the Unit Parameters and the Line Parameters for one (1) line is shown in Fig. 14-7; a printout of the Data Registers for a Basic Unit is shown in Fig. 14-5.

SPECIAL FUNCTION 2	
 AM1 PLUS KEYBOARD	[D] [6] [2] [B] TERMINAL KEYBOARD

```
                    UNIT PARAMETERS (LINE 00)
LINE          01;00;
CLOC 1748:011988;
SPCL FUNCTION  1;

UNIT PARAMETERS 17:48 01/19/88
RUNNING
RANDOM MODE
AUTO CONTINUE
ERROR REPORTS ENABLED
AUTOMATIC DATA READOUT ENABLED
START TIME 1: 00:00 01/01/00 FINISH TIME 1: 00:00 01/01/00
START TIME 2: 00:00 01/01/00 FINISH TIME 2: 00:00 01/01/00
WAIT (-) DURATION: 03 SECONDS
CUT THROUGH TIME: 01 SECONDS
POWER ON RECALL-DIALLED NUMBER: 1, PARAMETERS: 1
LAST RECALL-DIALLED NUMBER: 4 PARAMETERS: 0
BAUD RATE: 0300
PARITY: EVEN
VERSION: 01

        LINE PARAMETERS, LINE 01 (For Digital T1 Unit)

LINE          00;01;
ON=1 OFF=0     1;
SPCL FUNCTION  1;

LINE PARAMETERS
LINE          01
  ON=1 OFF=0     1
  ORIG PORT   B:01
  TERM PORT   B:02
TEL #:
  9999906
  DT DELAY      03
  DT FAIL       15
  PR=1 UNPR=2    1
  CONF TONE     82
  SUP CH 1=N 2=Y 1
  TIMEOUT-RNG 10:1
  INTERCALL     03
  CALL-CALL   0000
  TT=1 DP=2 MF=3 4
  ON-OFF TIM 35:35
  CONV TIME   0000
  START DELAY  000
  FLASH TIME  8500
  CONFIRM TRIES  2

DATA READOUT 17:50 01/19/88
CUM RUN TIME: 00373
LINE   ATT   AVGDT  DTDLY   NODT  NORNG  NOTON  AVGPD  COMPL  RTIME
 01   00000  -----  00000  00000  00000  00000  -----  00000  00000

TERMINATIONS:  00000
```

Figure 14-7. Special Function 1: Sample Printouts

14.09 PRINTOUTS ON COMMAND, continued

C. SPECIAL FUNCTION 3. Print Data Registers Only of All Lines.

SPECIAL FUNCTION 3	
SHIFT 0 · 6 SPCL · 3 ETR ! · CR/STP PARAM B	[D] [6] [3] [B]
AM1 PLUS KEYBOARD	TERMINAL KEYBOARD

Notice that the contents of this printout are identical to the Automatic Hourly Data Printout shown in Fig. 14-5. The only difference is that this printout can be output at any time, whereas the Automatic Hourly Data Printout will only print each hour, on the hour (per the Real Time Clock).

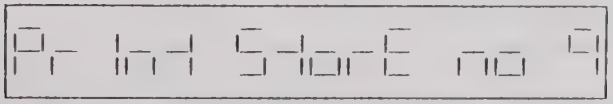
D. SPECIAL FUNCTION D. Print Stored Parameters and Telephone Numbers (from a EEPROM memory location), see Para. 11.06 and 11.09 concerning EEPROM memories.

SPECIAL FUNCTION D	
SHIFT 0 · 6 SPCL · SHIFT 0 · SHIFT 0 · CR/STP PARAM B	[D] [6] [D] [D] [B]
AM1 PLUS KEYBOARD	TERMINAL KEYBOARD

Follow the instructions below for the "PRINT STORE" prompt.

CALL PARAMETER/DATA DISPLAY

SPCL FUNCTION D;



PRINT STORE NO 9;

Possible entries:
- 9 = no operation (default), i.e. do not print
- 1 = print Parameters and Telephone Numbers in EEPROM location 1
- 2 = print Parameters and Telephone Numbers in EEPROM location 2
- 3 = print Parameters and Telephone Numbers in EEPROM location 3
- 4 = print Parameters and Telephone Numbers in EEPROM location 4

Enter 1, 2, 3 or 4 to print Parameters and Telephone Numbers or leave the 9 to not have a printout. Press [B] to enter value sele[illegible] the printout.

NOTE

It is not possible to directly print out the contents of EPROM (memory location "0"). To print out the contents of the EPROM:

1. Write the EPROM information into RAM with SPCL FUNCTION B (Para. 11.10)
2. Print the contents of the RAM with SPCL FUNCTION 1 (Para. 14.09,A): LINE 00 & 01.

14.10 MISCELLANEOUS STATUS PRINTOUTS

Status information is delivered to the printer/CRT for certain events. Sample status printouts with explanations are listed below.

A. : WER OFF AT: 13:40 01/14/88 POWER ON AT: 13:41 01/14/88
Power Fail Report. If power is lost and then regained, this printout records the time and date of power OFF and power ON. This printout also records when power is voluntarily turned OFF and ON. The printout is delivered when power comes ON.

B. START @ 11:00 01/20/88
FINISHING @ 11:29 01/20/88
Manual Start/Finish. Times and dates are recorded.

START @ 09:31 03/13/88
STOP @ 10:49 03/13/88
Manual Start/Stop. Times and dates are recorded.

C. START 1 @ 01:30 01/20/88
FINISH 1 @ 03:30 01/20/88
START 2 @ 01:00 01/21/88
FINISH 2 @ 05:30 01/21/88
Automatic Start/Finish. Times and dates are output when these events actually occur. The times are set with Unit Parameters per Para. 9.07.

D. SPCL FUNCTION 1;4;
ALL REGISTERS CLEARED @ 11:30 01/20/88

SPCL FUNCTION 1;5;
SELECTED LINE REGISTERS CLEARED @ 12:30 01/20/88

Data Register Clear. See Para. 13.02.

E. RUN TIME 00243;B
LINE 02
1=ON 2=OFF 1;
Stepping with [ETR/STP PARAM,B]. The number of the next Line Parameters being reviewed is output when stepping from the last Data Register of one line to the first Line Parameter prompt of the next line. In this example, "LINE 02" is output automatically in stepping from Line 01 to Line 02 Line Parameters.

F. LO HI DB :06:06;10:10;C
LINE 09
LO HI DB :06:06;
Stepping with [ETR/STP LINE,C]. The number of the next Line Parameters is output automatically. In this example, the user changed the LO HI DB values for Line 08 and then stepped to the same parameter on Line 09. The header "LINE 09" is output automatically.

14.11 CHAINED SETS: PURPOSE AND INSTALLATION

Chained Sets: Definition and Purpose. Any AM1PLUS Basic Unit, with or without an Expansion Unit or T1 Adaptor Unit, can be "chained" to other AM1PLUS Basic Units with a Chaining Cable (model 48-0015). Up to 15 Sets can be chained together to achieve a maximum System capacity of 450 Originate and 450 Terminate Ports.

There are two (2) advantages in chaining multiple sets instead of operating the same number of multiple sets as stand-alone:

A. The chained sets can share a common printer and/or be externally controlled by a single terminal.
B. When operating in Synchronous Mode (for call origination), all sets are synchronized and all lines will initiate calls simultaneously.

Setup Requirements. It is good practice to confirm that each individual Set is operating properly before chaining the Sets together. Two (2) requirements in order to chain multiple sets:

A. Each AM1PLUS Basic Unit must be equipped with an RS232 Port; see Para. 14.02. All interfaces must be set for the same Baud Rate, Parity, etc; see Para. 14.04.
B. The AM1PLUS Basic Units must be connected with 48-0015 Chaining Cables.

Figure 14-8 illustrates how AM1 PLUS sets are chained together.

Cables. A 48-0015 Chaining Cable has a female DB25 at one end and a "T" connection at the other end with back-to-back DB25 connectors, one female and one male; it connects the RS232 Ports (labelled "AUX") of the Basic Units.

The 48-0012 Universal RS232 Port Cable and 48-0084 Printer Cable are adapted to connect to the printer or data terminal as discussed in Para. 14.05 and Para. 14.15.

A 48-0001 Expansion (ribbon) Cable is supplied with each Expansion Unit (see Para. 8.02,C,D) and a 48-0056 Cable with each T1 Adaptor Unit (see Para. 8.07,D,E). These Cables are connected the same as for stand-alone operation; see Para. 3.08.

Installation. Procedure for chaining sets (refer to Fig. 14-8):

1. Begin with the last Basic Unit in the chain and work toward the beginning of the chain.
2. Plug the single connector end of a 48-0015 cable into the RS232 Port of the last Basic Unit in the chain.
3. Plug the female of the "T" end of the cable into the RS232 Port of the next Basic Unit in the chain.
4. Use another 48-0015 cable to connect the next Basic Unit as in Steps 2 and 3 (except the single connector end is now plugged into the male side of the "T" end of the previous 48-0015 cable).
5. Continue repeating Step 4 as necessary until all Basic Units are connected together.
6. Using a 48-0012 cable (Fig. 14-2) or 48-0084 cable (Fig. 14-11), connect the printer or terminal to the first Basic Unit in the chain (plug into the male side of the "T" of the 48-0015 cable).

14.11 CHAINED SETS: PURPOSE AND INSTALLATION, continued

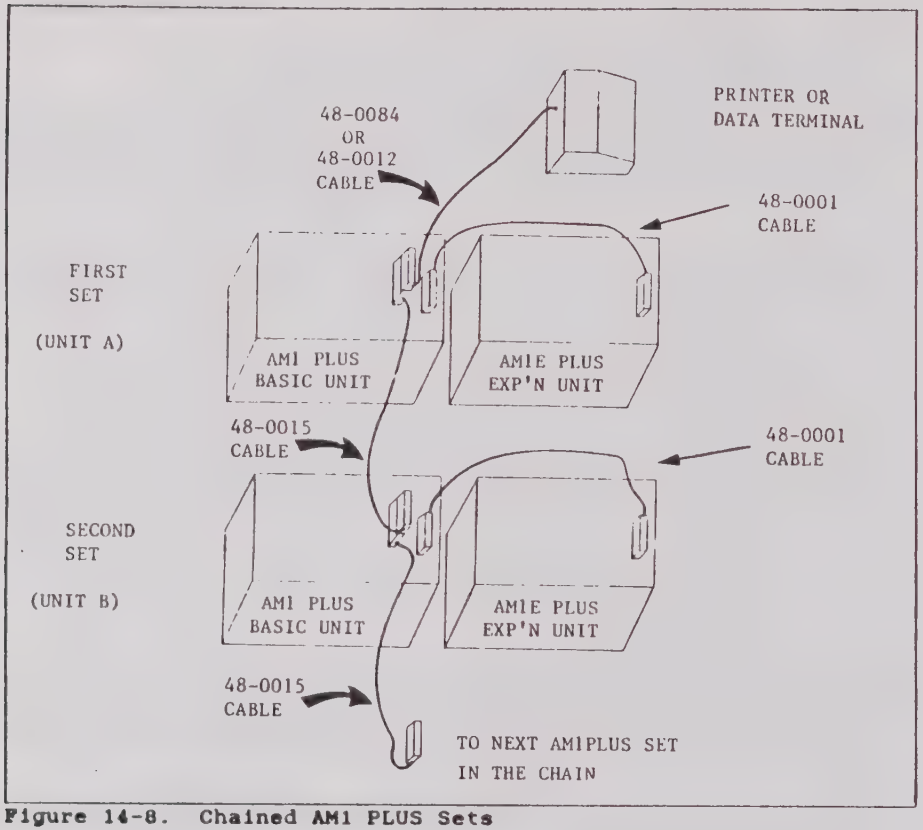


Figure 14-8. Chained AM1 PLUS Sets

14.12 CHAINED SETS: OPERATION

Four (4) subjects are covered in this paragraph with respect to operation of Chained sets:

A. Addresses
B. Automatic Interaction Functions
C. Operation with Front Panel Keyboard/Displays
D. Operation from External Terminal

A. ADDRESSES

Each AM1 PLUS/AM1E PLUS set in the chain has an "address" which identifies its position in the chain. The AM1 PLUS Basic Units automatically recognize their position in the chain and assume their proper address.

Addresses are letters, starting with "A" for the first set and continuing in alphabetical order up to a maximum of 15 possible sets in the chain, as indicated at the top of the next page:

14.12 CHAINED SETS: OPERATION, continued

A. ADDRESSES, continued

POSITION OF SET IN THE CHAIN														
1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
ADDRESS														

The address is used as described below:

1. The address is in the header of DATA READOUTS from Chained sets to identify the set from which the data came. The sets are labelled "UNIT: A", "UNIT: B", etc.
2. The address letter appears before the Line number in a Real Time Error Report; see Fig. 14-6 for examples.
3. When controlling a Chain of sets (from a terminal connected to the first Basic Unit in the Chain), it is necessary to preface the commands with an address to identify the set to be controlled. It is also possible to send certain "global" commands to all sets in the chain by first sending the global address character "Z"; see "Global Operation of Chained Sets" in Para. 14.12,D.

B. AUTOMATIC INTERACTION FUNCTIONS

There are three (3) functions which automatically cause interaction between Chained sets:

-Synchronous Mode call generation,
-Automatic Hourly Data Printouts and
-Real Time Error Reports

Synchronous Operation. One or more AM1 PLUS sets in a Chain may be set for Synchronous Mode of call origination. Since the purpose of this mode is to provide a large number of Originate Ports generating simultaneous off-hook calls, note the following:

1. All sets operating in Synchronous Mode must be running (from a START command) or no calls will be originated.
2. Conversely, if all Synchronous Mode sets are running and then any one of them is stopped (with a FINISH or STOP command), the remaining sets will finish any calls in progress and then they will not originate any further calls until the stopped set is started again.

Mixture of Random and Synchronous Mode Sets. If desired, some of the sets in a Chain can be running in Random call originate mode while other sets in the chain are running in Synchronous Mode. The sets running in Random Mode will originate calls randomly without regard to any other sets generating calls synchronously. While the sets in the Chain are running in any combination of Synchronous and/or Random Mode, call origination of any specific line may be enabled or disabled (see Para. 10.02 and Para. 13.05).

Automatic Hourly Data Printout. See Fig. 14-9 for sample printout. The first set in the Chain controls the Automatic Hourly Data Printout. Note the following points:

1. The setting of the Hourly Data Printout Unit Parameter (Para. 9.05) of the first set in the Chain (UNIT: A) determines whether this printout is enabled or disabled for all sets in the Chain.

```
UNIT: A
DATA READOUT 08:00 04/06/88
CUM RUN TIME:  00033
LINE    ATT   AVGDT  DTDLY   NODT  NORNG  NOTON  AVGPD  COMPL  RTIME
 01   00063  001.1  00000  00000  00000  00000  000.2  00063  00008
 02   00009  002.0  00000  00000  00000  00000  000.2  00009  00001
 03   00000  -----  00000  00000  00000  00000  -----  00000  00000
 04   00000  -----  00000  00000  00000  00000  -----  00000  00000
 05   00159  000.2  00000  00000  00000  00000  000.2  00159  00015
 06   00000  -----  00000  00000  00000  00000  -----  00000  00000
 07   00000  -----  00000  00000  00000  00000  -----  00000  00000
 08   00000  -----  00000  00000  00000  00000  -----  00000  00000
 09   00000  -----  00000  00000  00000  00000  -----  00000  00000
 10   00000  -----  00000  00000  00000  00000  -----  00000  00000
 11   00063  001.1  00000  00000  00000  00000  000.2  00063  00008
 12   00009  002.0  00000  00000  00000  00000  000.2  00009  00001
 13   00000  -----  00000  00000  00000  00000  -----  00000  00000
 14   00000  -----  00000  00000  00000  00000  -----  00000  00000
 15   00159  000.2  00000  00000  00000  00000  000.2  00159  00015
 16   00000  -----  00000  00000  00000  00000  -----  00000  00000
 17   00000  -----  00000  00000  00000  00000  -----  00000  00000
 18   00000  -----  00000  00000  00000  00000  -----  00000  00000
 19   00000  -----  00000  00000  00000  00000  -----  00000  00000
 20   00000  -----  00000  00000  00000  00000  -----  00000  00000
 21   00063  001.1  00000  00000  00000  00000  000.2  00063  00008
 22   00009  002.0  00000  00000  00000  00000  000.2  00009  00001
 23   00000  -----  00000  00000  00000  00000  -----  00000  00000
 24   00000  -----  00000  00000  00000  00000  -----  00000  00000
 25   00159  000.2  00000  00000  00000  00000  000.2  00159  00015
 26   00000  -----  00000  00000  00000  00000  -----  00000  00000
 27   00000  -----  00000  00000  00000  00000  -----  00000  00000
 28   00000  -----  00000  00000  00000  00000  -----  00000  00000
 29   00000  -----  00000  00000  00000  00000  -----  00000  00000
 30   00000  -----  00000  00000  00000  00000  -----  00000  00000
TOTL 000693 0000.5 000000 000000 000000 000000 0000.2 000693

CALL TERMINATION REGISTERS
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
TOTAL: 000000

UNIT: B
DATA READOUT 08:01 04/06/88
CUM RUN TIME:  00034
LINE    ATT   AVGDT  DTDLY   NODT  NORNG  NOTON  AVGPD  COMPL  RTIME
 01   00063  001.1  00000  00000  00000  00000  000.2  00063  00008
 02   00009  002.0  00000  00000  00000  00000  000.2  00009  00001
 03   00000  -----  00000  00000  00000  00000  -----  00000  00000
 04   00000  -----  00000  00000  00000  00000  -----  00000  00000
 05   00159  000.2  00000  00000  00000  00000  000.2  00159  00015
 06   00000  -----  00000  00000  00000  00000  -----  00000  00000
 07   00000  -----  00000  00000  00000  00000  -----  00000  00000
 08   00000  -----  00000  00000  00000  00000  -----  00000  00000
 09   00000  -----  00000  00000  00000  00000  -----  00000  00000
 10   00000  -----  00000  00000  00000  00000  -----  00000  00000
TOTL 000231 0000.5 000000 000000 000000 000000 0000.2 000231

CALL TERMINATION REGISTERS
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
TOTAL: 000000


UNIT: A  is an AM1 PLUS-111 with AM1E PLUS-11 Expansion Unit
UNIT: B  is just an AM1 PLUS-111 Basic Unit
```

Figure 14-9. Automatic Hourly Data Printout, Chained Units

14.12 CHAINED SETS: OPERATION, continued

B. AUTOMATIC INTERACTION FUNCTIONS, continued

Automatic Hourly Data Printout, continued

2. For sets other than the first set in the Chain, it does not matter if the Hourly Data Printout Unit Parameter is enabled or disabled. Only the parameter setting of the first set controls this printout.
3. If the Hourly Data Printout is enabled, the printout begins each hour, on the hour, per the Real Time Clock of the first set in the Chain. When the printout begins, all sets in the Chain sequentially output a data printout.
4. Refer to Fig. 14-9; the sequence of the printout is listed below:
   a. Each hour the first set in the Chain outputs the header "UNIT: A", followed by its 10 or 30 lines of data (depending on the configuration of the set).
   b. After the first printout, the first set signals the second set to begin its printout (with header "UNIT: B").
   c. The process continues until, in domino fashion, all sets have completed their printouts.
   d. There is not an automatic reset to zero of the data counts after each printout; the contents of the printout are those of the Data Registers. See Para. 13.02 to clear Data Registers.
5. If any Real Time Error messages are originated during the data printout, they will be held back (buffered) until the automatic printout is completed. After the Automatic Hourly Data Printout, any buffered error messages will be output.

NOTE

Unlike the Automatic Hourly Data Printout, the Real Time Error Reports are enabled or disabled with the Unit Parameter (Para. 9.06) for each set individually. It is possible to enable the Real Time Error Report for some sets and disable it for other sets in the Chain.

Real Time Error Reports. If present, these are output sequentially from the buffers of the respective Sets, starting with the first Set and cycling through to the last Set in the chain.

C. OPERATION WITH FRONT PANEL KEYBOARD/DISPLAYS

Each AM1 PLUS/AM1E PLUS set is controlled from its own front panel keyboard/display when sets are connected in a Chain in any of the configurations listed below:

1. without an external Terminal
2. with a read-only printer or
3. with a CRT without a keyboard

For these cases, there is no operator control between sets in the Chain. Each set will respond only to keyboard commands from its own Basic Unit and these commands will not affect other sets in the Chain.

D. OPERATION FROM EXTERNAL TERMINAL

A Chain of AM1 PLUS sets can be controlled from a Terminal connected to the RS232 Port of the first set in the Chain (see Fig. 14-8). The Terminal can be a keyboard/printer, a keyboard/CRT, or any other send/receive device capable of sending/receiving a serial ASCII data stream.

The send/receive Terminal may be connected directly or may be remotely connected through modems (see Para. 14.14).

Commands are sent in two (2) ways:
- -to one (1) set in the Chain or
- -simultaneously (Global Commands) to all sets in the chain (only possible with certain commands).

External Operation of One (1) Set in the Chain. Because all AM1 PLUS sets in the Chain are effectively connected together on a "party" line, it is necessary to first address the set to which commands are to be sent. To address a set:

1. Enter the ASCII character "!" (usually, by pressing [SHIFT][1]).
2. Enter the address letter, [A] or [B] or [C], etc., associated with the desired set in the chain.

NOTES

- -For an "!" to be accepted, at least two (2) Basic Units must be Chained together (with the power ON) and be set for the same Baud rate as the Terminal.
- -Whenever the address is sent (for example, "!A"), the set will echo the command.
- -The address letter is a capital letter (upper case); lower case letters will not work.
- -Do not confuse upper case address letters with upper case letters used in the operation of a set after it is addressed; address letters are entered directly, whereas [D] (the SHIFT function) is pressed first before entering an upper case letter used in the operation of the set; see EXAMPLES in Para. 14.06.

For example, "!B" will cause the second set in the Chain ("UNIT: B") to respond to all subsequent commands until another set is addressed. To address a different set in the Chain, send "!" followed by its address letter. When in doubt as to which set was last addressed, re-send the "!" character followed by the address letter of the desired set.

Once a set has been addressed, operate per GENERAL OPERATION NOTES, Para. 14.06.

14.12 CHAINED SETS: OPERATION, continued

D. OPERATION FROM EXTERNAL TERMINAL, continued

Global Operation of Chained Sets. There are certain commands which can be sent simultaneously to all sets in the Chain; these are called "Global Commands".

Before sending a Global Command, it is first necessary to send a special address which causes all sets in the Chain respond to subsequent (global) commands.

To send a Global Command:

1. Send "!Z", usually by pressing [SHIFT][1] and then [Z]. The Chain will echo back the characters "!Z" as they are entered. "!Z" is the special Global Command address.
2. Enter the desired Global Command per Table 14-4.

Table 14-4
Global Commands

COMMAND	FUNCTION
D7	START (causes sets to begin call generation)
D9	STOP (causes sets to immediately end call generation)
D2	FINISH (causes sets to end call generation at the completion of the calls in progress)
D64B	Reset All Registers (resets all Data Registers to zero)
D68B	Enable Real-Time Error Reporting
D69B	Disable Real-Time Error Reporting
D5xxyyB	Copy from Line xx to Line yy
D5xx99B	Copy from Line xx to All Other Lines
ctrl B	Cause Data Printout from All Lines in the Chain
ctrl @	Interrupt (Stop) Data Printout from Lines in the Chain
D4	Change Operating Mode: will toggle from (1) Automatic Continue to (2) Automatic Stop-on-Trouble to (3) Manual
D41B	Change Operating Mode and Select "Synchronous" Call Generation Mode.
D42B	Change Operating Mode and Select "Random" Call Generation Mode.

D. OPERATION FROM EXTERNAL TERMINAL, continued

Global Operation of Chained Sets, continued

NOTE

The Automatic Hourly Data Printout could be considered a "Global" function in that it affects all sets in the chain. However, the only command necessary to enable this hourly printout is to enable the Automatic Hourly Printout parameter (Para. 9.05) of the first set in the chain. See Para. 14.12,B.

14.13 COMPUTER DOWNLOADING OF PARAMETERS

Computer downloading of parameters is very similar to manual loading of parameters. Study Para. 14.06 on manual operation before reading this paragraph.

Connect the computer to the RS232 Port per Para. 14.05 and program the computer to follow the procedure listed below:

1. To initiate computer operation, enter the character "(", an open parenthesis.
2. After the the AM1 PLUS receives the "(", it will no longer issue "prompts". Instead, it will only echo the characters it receives from the computer.

NOTE

To be sure all characters are received correctly by the AM1 PLUS, write the computer program to require receipt of the echoed character before continuing with the next character. This will prevent sending characters faster than they can be received by the AM1 PLUS.

3. Enter "A" to select line.
4. Then enter "00" to access Unit Parameters or "01" thru "30" to access desired Line Parameters.
5. Follow the sequence for Unit Parameters per Section 9 or the sequence for Line Parameters per Section 10.
6. Enter the correct characters for the desired parameter setting and then enter "B" (Step Parameter) or "C" (Step Line).
7. When the AM1 PLUS receives a "B" or "C" command, it evaluates the parameter characters just entered. If the characters are valid, the "B" or "C" will be echoed. If the characters are invalid, the AM1 PLUS will echo a "?" and expect the parameter characters to be re-entered correctly.
8. To go to manual parameter entry, enter the character ")", a close parenthesis. Prompts will then be output as shown in the EXAMPLE dialogue in Para. 14.06.

14.13 COMPUTER DOWNLOADING OF PARAMETERS, continued

Dumping Information. It is possible to dump a string of characters into the AM1 PLUS without regard to the characters echoed back by the AM1 PLUS. However, when dumping information, there is the possiblity of dumping characters faster than the AM1 PLUS can receive them. As a rule, data should be dumped at no higher than 2400 Baud.

Error checking is implemented by comparing each echoed character with the character just sent. The computer can use as little or as much error checking as desired.

If there is a problem with dumping character strings, try a lower Baud rate. To be safe, do not dump information; instead, require the program to receive the echoed character before proceeding with the next character.

Character Strings. From the AM1 PLUS point of view, there is no limit to the length of the character string. But if there is a line length limit with the computer program, when the line length is almost at the limit, enter a RETURN (carriage return) instead of a "B" to step to the next parameter.

EXAMPLE: A character string to download Unit Parameters is given below. See Section 9 for explanation of Unit Parameters. Parameter values are represented by lower case letters in alphabetical order. For comparison, the same parameter values are also shown as they would appear with prompts.

Character String to Set Unit Parameters:

```
AOOBaaaaaaaaaaBbBcBdBeBfffffffffBgggggggggBhhhhhhhhhhR
iiiiiiiiiBjjBkkBlBmBBBnnnnBo
```

A = Line Select
B = Enter Parameter value and Step to next Parameter
R = Carriage Return (performs same function as "B")

See prompts below for correspondence of parameter values (lower case letters). For example,
aaaaaaaaaa = Parameter value for Real Time Clock

Setting Unit Parameters with Prompts:

```
LINE          01;00;                    - TIME        03;jj;
CLOC 0000:010100;aaaa:aaaaaa;           CT TIME       02;kk;
MODE AC=1 AS=2 1;b;                     PWR RCL TEL    1;l;
SYN=1 RAN=2    2;c;                     PWR RCL PARAM  0;m;
AUTO PRT NO=0  1;d;                     LAST RCL TEL   3 *
RT ERR YES=1   0;e;                     LAST RCL PARAM 2 *
ST 1 0000:010100;ffff:ffffff;           BAUD        0300;nnnn;
FI 1 0000:010100;gggg:gggggg;           PARITY ODD=1   0;o;
ST 2 0000:010100;hhhh:hhhhhh;           VERSION       16 *
FI 2 0000:010100;iiii:iiiiii;
```

* = No value entered because display is for information only; "B" is entered after these displays to step to the next parameter.

14.14 REMOTE OPERATION THROUGH MODEMS

Operation. The operations that can be done locally from an external Terminal can also be done Remotely through Modems over a network.

Setup. Remember that with Remote Operation, the switches on the front panels of the AM1 PLUS units at the remote location are not within reach from the local Terminal. Therefore, all setting of switches must be done ahead of time at the remote site when the AM1 PLUS unit(s) is being connected.

NOTE

Set all the Line Switches (Originate Port Enable Switches) to an ON position. These switches can then be remotely turned ON or OFF using the Line Enable prompt (Para. 10.02). If a Line Switch is OFF, it cannot be turned ON remotely.

Connection. Connect the AM1 PLUS as shown in Fig. 14-10. Two (2) Modems are required; either Dial-Up Modems or Private-Line Modems can be used. Connect the Modem to the AM1 PLUS in the same way as a Terminal for Local operation per Para. 14.04 and Para. 14.05.

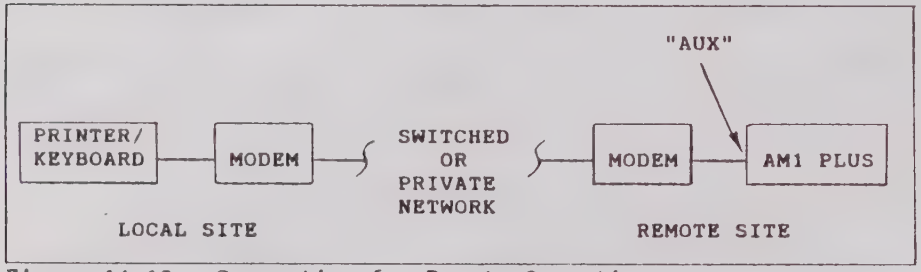


Figure 14-10. Connection for Remote Operation

14.15 OPTIONAL PRINTER/TERMINAL (24-0016) AND PRINTER CABLE (48-0084)

Printer/Terminal. The optional 24-0016 Portable KSR* Printer/Terminal is a thermal printer combined with a terminal keyboard. The model 24-0016 includes a 48-0084 Printer Cable and an 8 1/2" x 100-foot roll of thermal paper. The 24-0016 Printer prints at 30 characters per second (300 Baud) in either 80 or 132 columns.

* KSR = Keyboard Send/Receive

Printer Cable (48-0084). This cable is illustrated in Fig. 14-11, which shows strapping on both the AM1 PLUS end and the Printer end. This cable is designed to connect the 24-0016 Portable Printer/Terminal to the RS232 port of an AM1 PLUS or AM1XT Basic Unit. The 48-0084 is compatible with many other RS232 devices, however; it can be used with any printer, terminal or CRT that will work with the indicated connector and strapping.

14.15 OPTIONAL PRINTER/TERMINAL (24-0016)
AND PRINTER CABLE (48-0084), continued

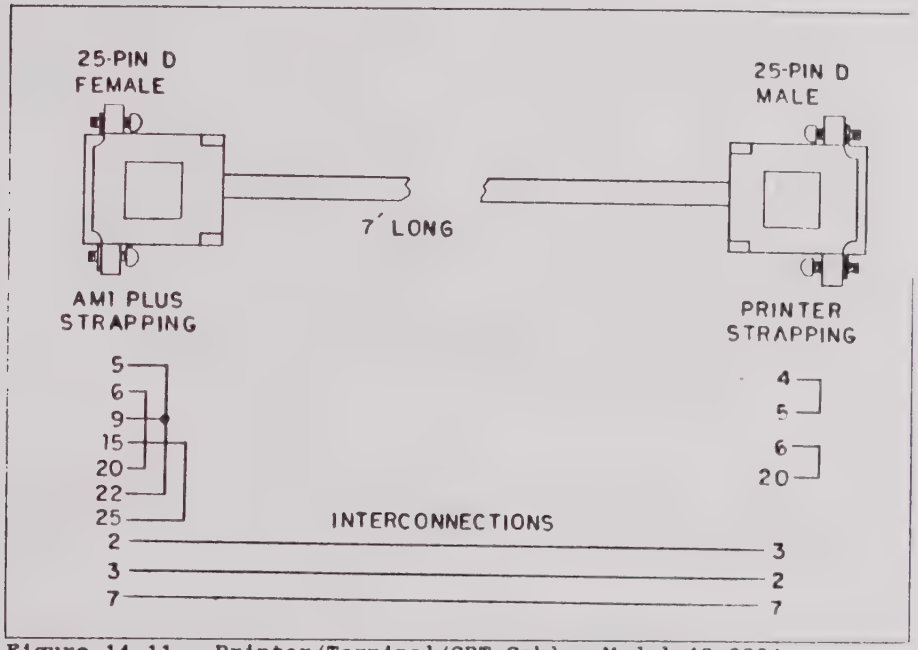


Figure 14-11. Printer/Terminal/CRT Cable, Model 48-0084

15. APPLICATION NOTES

15.01 INTRODUCTION

This section includes a variety of different topics that relate to particular applications. The paragraphs in this section are listed below:

15.02 Call Rate and Timing
15.03 How to Pause to Detect an External Signal
15.04 E&M Signaling
15.05 Direct Inward Dialing (D.I.D.)
15.06 FXO/FXS Compatibility with T1 Lines
15.07 Digital (T1) Unpaired Operation
15.08 Analog Unpaired Operation, Originating/Terminating with AM1 Unit(s) with Type 8 Mode of Operation
15.09 Analog Unpaired Operation, Terminating at an AM1 Unit with Type 0 Mode of Operation Only
15.10 Voicepath Confirmation Tone Failure Analysis
15.11 Example Dialed Number Field Call Sequence

15.02 CALL RATE AND TIMING

Shared vs. Individual Tone Generators. When Tone Dialing, the tone generator(s) used is an important factor in the rate at which an AM1 PLUS generates traffic. See Para. 10.19 concerning different tone dialing modes.

When using TT Dialing Mode 1 or MF Dialing Mode 3, one (1) tone generator is used by all lines. Traffic generation is slowed down when lines have to wait to use the common tone generator.

When using TT Dialing Mode 4 or DMF Dialing Mode 4, however, no waiting is involved to generate tones when dialing. DMF is generated digitally and TT Dialing Mode 4 is generated with individual tone generators on each line card. Dialing Mode 4 is therefore much faster than Dialing Modes 1 and 3. **Use Dialing Mode 4 for maximum call generation.**

Programming the Call Rate. If the purpose of using the AM1 PLUS is to load a switch, it is important to know how much traffic will be generated (calls per hour). The Call-to-Call Time parameter (Para. 10.18) can be used in Random Mode (Para. 9.04) to exactly program the call rate. In order to set the Call-to-Call Time, however, the user must know approximately how long the call sequence will take. The reason for this is that, in order to work, the Call-to-Call Time must be set longer than the call sequence, including the Intercall Time.

Call Duration. The events that take place during a typical call sequence are listed in Table 15-1 along with the time constraints. The events for a given call depend on how the Unit and Line Parameters are programmed and the Telephone Number (Dialed Number Field) for that particular line. How long each event takes in the call sequence depends on many factors, some of which have to do with the response time of the switch under test.

Table 15-1
Time Durations in a Typical Call Sequence

	EVENT	DURATION, SECONDS		
		RANGE		TYPICAL
		MIN.	MAX.	
1	Start Delay (optional)*	0	255	0
2	Originate Port off-hook	0	0	0
3	Wait for Start Dial signal (Dial Tone Fail time)	1	30	1
4	Dial Digits	.25	?	1
5	Wait for Ring or Seizure on Terminate Port (Paired Mode)	.5	50	1
6	Count Number of Rings	.5	?	1
7	Terminate Port off-hook (Answer, Ring Trip)	0	0	0
8	Cut Through Delay Time	1	25	2
9	Voicepath Confirmation Check(s)	.25**	.50**	.50
10	Conversation Time (optional)	0	1275	0
11	Originate and Terminate Ports both on-hook	0	0	0
12	Intercall Time or remaining Call-to-Call Time	1 ?	25 ?	1 ?
	TYPICAL TOTAL TIME FOR A CALL.....			7.5 sec.

*For Random Mode, Start Delay only delays the initial off-hook after the START command (Para. 10.27).
**One-way voicepath confirmation takes about .25 sec.
Two-way voicepath confirmation takes about .50 sec.

Dial-Digit Duration. The duration of Dialing Digits (Event 4 in Table 15-1), can vary greatly depending on the number of digits dialed and the Dialing Mode. The ON/OFF timing for Tone Dialing, and the Speed and Interdigit Delay Time for Pulse Dialing also affect the duration of the dialing. See Para. 10.19 and Para. 10.23 thru Para. 10.25. Typical times to dial one (1) digit are listed below:

Pulse Dialing	1.00 sec/digit
DTMF (shared generator)	0.50 sec/digit
DTMF (line card generators)	0.13 sec/digit
MF (shared generator)	0.50 sec/digit
DMF	0.13 sec/digit

Call Rate. The AM1 PLUS can be programmed to maximum load a switch by using Random Mode and making minimum settings of the durations of the events of the call. Remember that the response time of the switch under test (for example, the time it takes to output Dial Tone) also influences call generation rate.

A test was done with an AM1 PLUS-1/AM1E PLUS-1 Set loading an Ameritec AM7 Central Office Simulator; the AM1 PLUS was in Random Mode with 30 Analog Loop Start lines, each dialing 7 digits using TT (DTMF) Dialing Mode 4 (line card tone generators) with ON/OFF time set to 35 ms/35 ms. The call rate was 14,230 calls/hr with 2-way voicepath confirmation and 20,000 calls/hr with 1-way voicepath confirmation.

15.02 CALL RATE AND TIMING, continued

Call Rate, continued.

EXAMPLE. Example calculations are given below for call rate, using a typical time of 7.5 sec. for a call (from Table 15-1).

For each line: 3600 sec/hr ÷ 7.5 sec/call = 480 calls/hr.
For 30 lines: 480 calls/hr/line x 30 lines = 14,400 calls/hr.

15.03 HOW TO PAUSE TO DETECT AN EXTERNAL SIGNAL

In some applications it is necessary to pause in the call sequence to wait for and detect an incoming signal from an external source.

For example, an external milliwatt source (1000 Hz) can be dialed up by the AM1 PLUS and then the incoming 1000 Hz can be detected to confirm the voicepath. To do this test, insert an "EE" in the dialed number field display (Para. 10.06) where the 1000 Hz is expected. To enter "EE", press [SHIFT,D][1,ESC][SHIFT,D][1,ESC].

The different possible commands to pause and wait for an external signal are listed below. These are taken from the list of possible secondary function dialed number field entries in Para. 10.06.

ESC (E)	Commands a temporary ESCAPE from the dialed number to look for Confirmation Tone as programmed by the CONF TONE parameter (**Paired Mode**), Para. 10.12, or O-T TONE parameter (**Unpaired Mode**), Para. 10.13. Appears as an "E" in the Dialed Number Field.
ESC, ESC (EE)	Stop dialing and wait for 1000 Hz tone (milliWatt). Appears as "EE" in Dialed Number Field.
ESC, C (EC)	Stop dialing and wait for a WINK of 100 ms, minimum duration. See Para. 15.05 for use of wink for Direct Inward Dialing (D.I.D.). Appears as "Ec" in Dialed Number Field.
PAUSE (P)	Wait for Dial Tone, wherever this is inserted in the Dialed Number sequence. Appears as a "P" in the Dialed Number Field. There is an automatic Wait-for-Dial-Tone before the Dialed Number Field of an Analog Originate Port (therefore no need to have a "P" as first digit for this case). For T1 Originate Ports, however, since the automatic Start Dial Signal is a WINK, if the T1 Originate Port is Dial Tone start, enter a "P" as the first digit.

See Para. 15.11 for EXAMPLE Dialed Number Field which contains several pauses to wait for external tones.

15.04 E&M SIGNALING

This paragraph covers E&M Trunk Connections and Trunk Types.

E&M Trunk Connections

A. Definitions

"E" and "M" defines a signaling interface convention under which Switching Equipment (SW.) may be connected to Transmission Equipment (T.E.) and visa versa.

There are "2-wire E&M" and "4-wire E&M" interfaces with contacts as listed below:

2-wire E&M: E, M, T, R
4-wire E&M: E, M, T, R, T1, R1

The contacts are used as described below:

E, M	These two wires are used for DC signaling, that is, on-hook/off-hook signals and dial pulsing. Ground and/or -48 Vdc are typically used for the DC signaling.
T, R (2-wire)	For 2-wire, these contacts are bi-directional (send and receive) over which voice band audio (voice and DTMF or MF signaling) is transmitted.
T, R (4-wire send)	For 4-wire, these contacts are uni-directional (send) over which voice band audio (voice and DTMF or MF signaling) is transmitted.
T1, R1 (4-wire receive)	Used in 4-wire only, these contacts are uni-directional (receive) over which voice band audio (voice and DTMF or MF signaling) is transmitted.

4-wire and 2-wire E&M interfaces between Switching and Transmission Equipment are illustrated in Fig. 15-1.

B. E&M Emulation Modes

Certain AM1 PLUS and AM1XT units can be configured to emulate (perform the same function as) either 2-wire or 4-wire Switching Equipment (SW.) or Transmission Equipment (T.E.). Figures 15-2 and 15-3 illustrate the two cases.

When emulating T.E. (Fig. 15-2), the AM1 PLUS or AM1XT originates telephone calls into the Trunk Interface of a Switch. In the example of Fig. 15-2, the call is connected to a subscriber loop ("Line Ckt") which is terminated back to the same AM1EXT-2 or -3.

When emulating SW. (Fig. 15-3), the AM1 PLUS or AM1XT originates telephone calls into the Signaling Circuit of the Transmission Equipment.

Table 15-2 identifies which AM1 PLUS and AM1XT units can be used to emulate T.E. and/or SW.

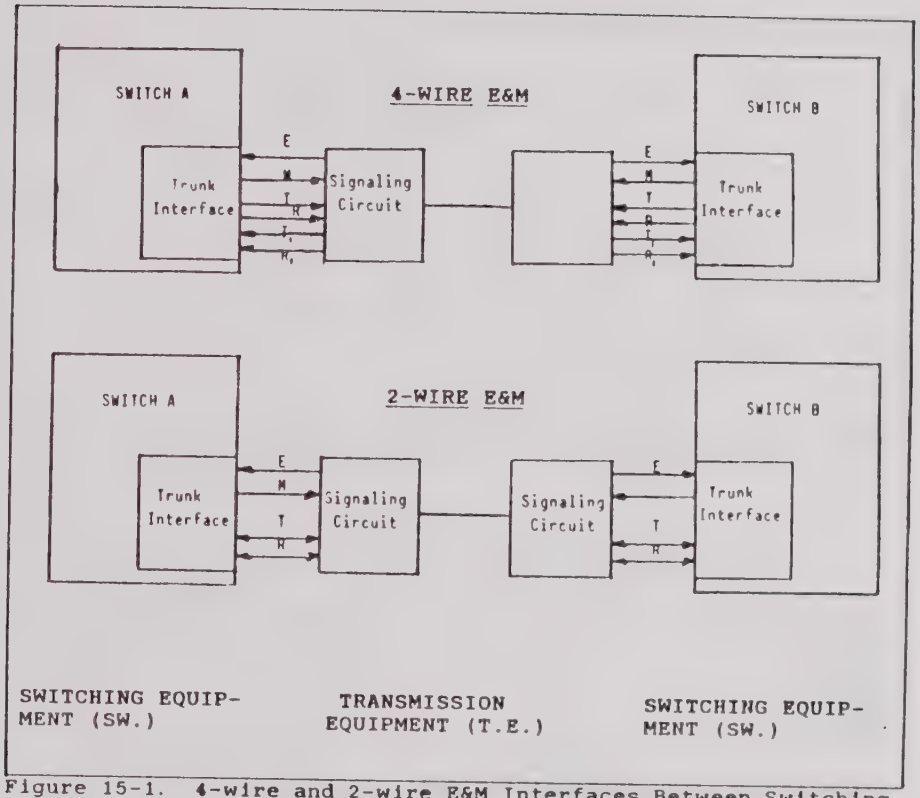


Figure 15-1. 4-wire and 2-wire E&M Interfaces Between Switching and Transmission Equipment

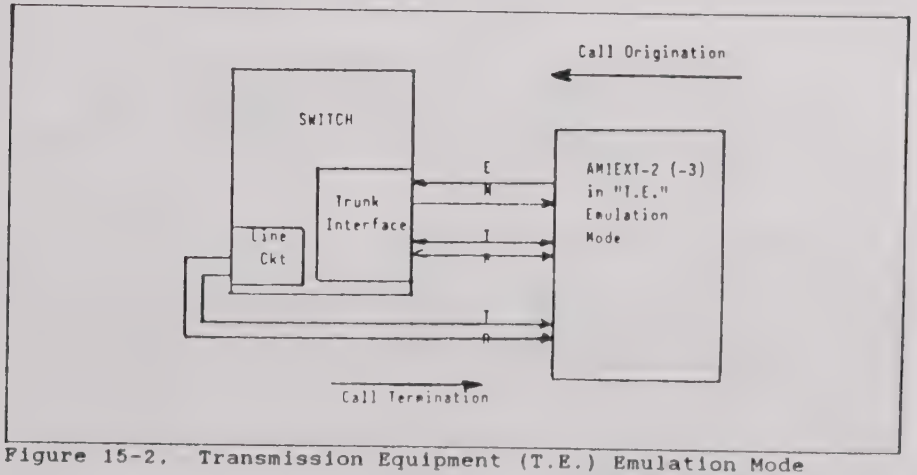


Figure 15-2. Transmission Equipment (T.E.) Emulation Mode

15.04 E&M SIGNALING, continued

E&M Trunk Connections, continued

B. **E&M Emulation Modes**, continued

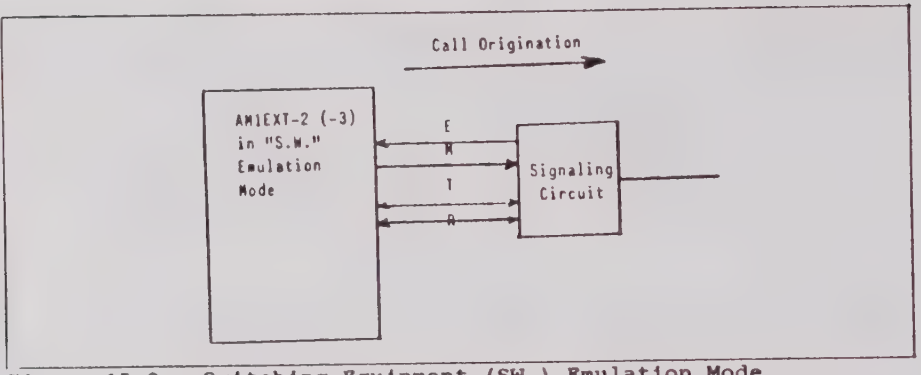


Figure 15-3. Switching Equipment (SW.) Emulation Mode

Table 15-2
Emulation Application

MODEL	EMULATES TRANSMISSION EQUIPMENT (T.E.)	EMULATES SWITCHING EQUIPMENT (SW.)
AM1 PLUS-2	X	
AM1E PLUS-3*	X	X
AM1XT-2	X	
AM1EXT-2	X	X
AM1EXT-3*	X	X
AM1EXT-4	X	

* With respect to the eight (8) E&M/loop line cards.

See Section 6 (AM1 PLUS-2) and Para. 8.04 (AM1EXT-2) for details on the two (2) kinds of E&M Line Cards available: E&M/E&M and E&M/Loop.

NOTE

Do not connect the AM1 PLUS-D Terminate Ports to circuits that will be sent Dial Pulses by the switch under test. A break in the incoming seizure signal (RCV signaling bit A) at the Terminate Port is interpreted as an on-hook (call aborted).

C. **AM1 PLUS and AM1XT Equivalent Circuits**

Activity on the E and M lead connections of the units listed in Table 15-2 depends on the emulation mode (SW. or T.E.) and circuit status (on-hook or off-hook). The E and M leads will send or receive either Ground or -48 Vdc signals as indicated in Fig. 15-4 and Fig. 15-5.

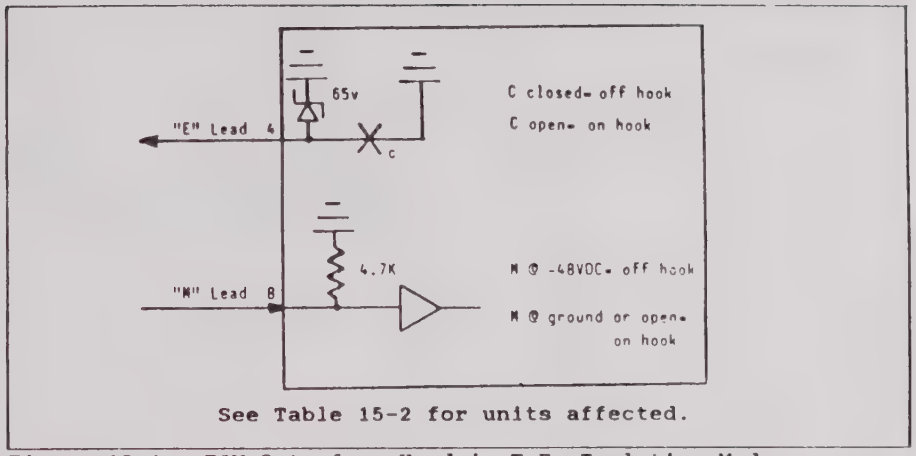


Figure 15-4. E&M Interface Used in T.E. Emulation Mode

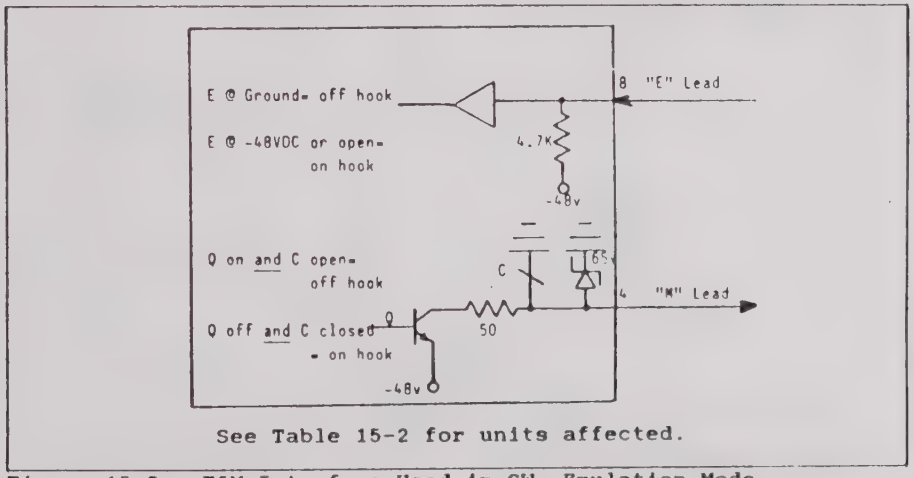


Figure 15-5. E&M Interface Used in SW. Emulation Mode

E&M Trunk Types

There are five (5) different types of E&M trunk. These differ mainly in the way -48 Vdc and Ground are supplied to the E&M leads. The AM1 PLUS/AM1XT units are directly compatible with E&M trunk Types I, II and III as defined in AT&T publication Notes on the Network. The units are also compatible with E&M trunk Types IV and V by using an external relay circuit (see Fig. 15-9).

See Fig. 15-6 thru 15-9 for schematic diagrams of Types I thru IV in both T.E. emulation and SW. emulation, including pin assignments which apply to AM1EXT-2 or -3 or AM1E PLUS-3.

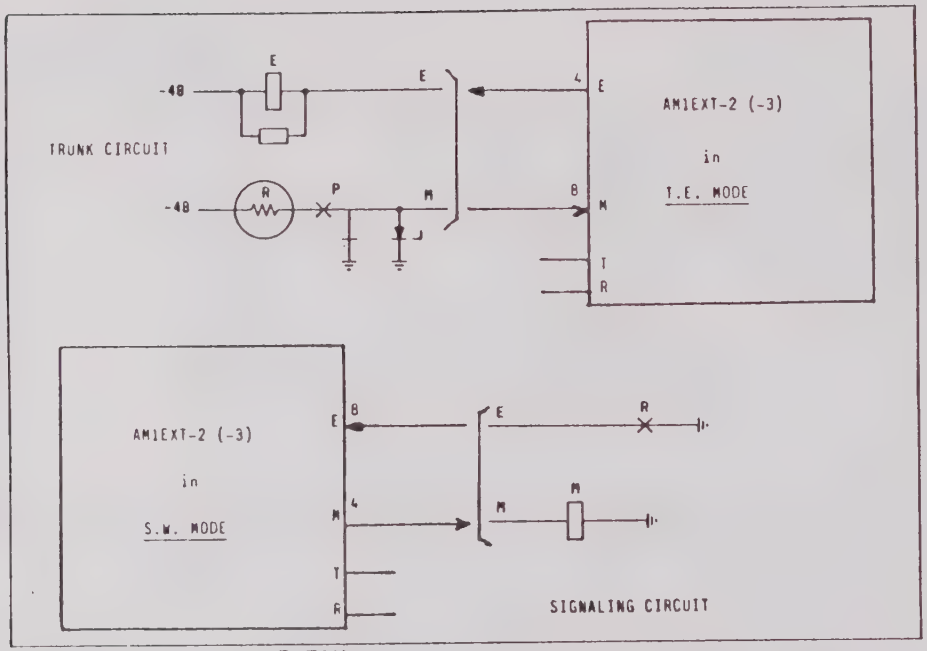


Figure 15-6. Type I E&M

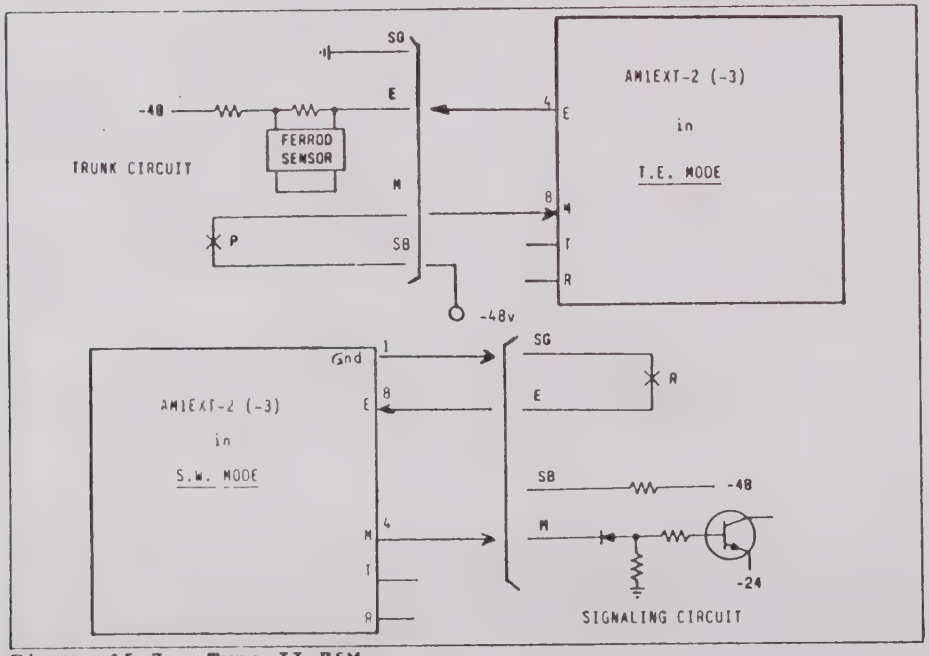


Figure 15-7. Type II E&M

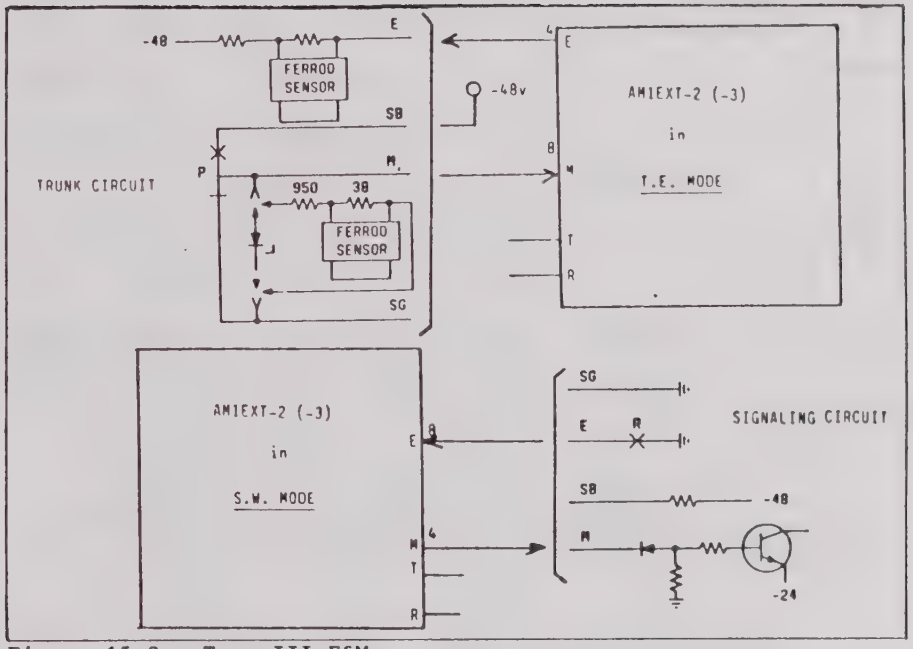


Figure 15-8. Type III E&M

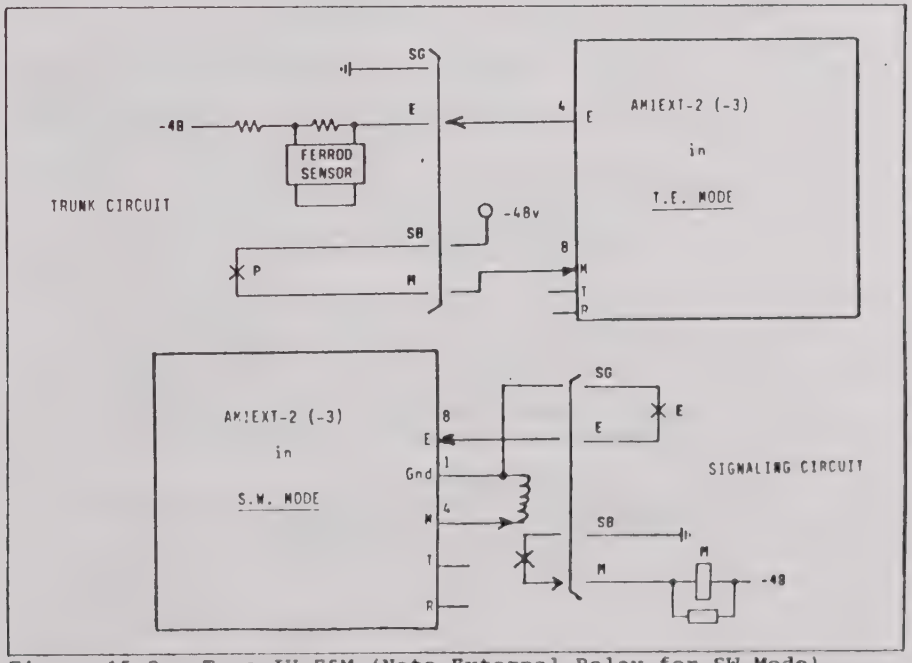
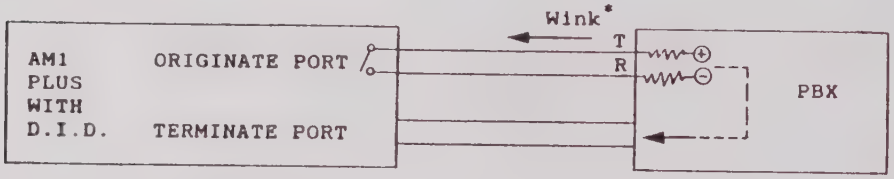


Figure 15-9. Type IV E&M (Note External Relay for SW Mode)

15.05 DIRECT INWARD DIALING (D.I.D.)

AM1 PLUS models with D.I.D. capability are: AM1 PLUS-1, AM1E PLUS-1 and AM1E PLUS-3.

EXAMPLE. A typical AM1 PLUS D.I.D. application is illustrated below:



* A "Wink" is a momentary reversal of polarity (reverse battery) applied to the originate line by the PBX. "Answer Supervision", however, is a continuous reverse battery.

The sequence of events:

1. AM1 PLUS Originate port goes off-hook and closes the loop. PBX supplies loop current.
2. AM1 PLUS Originate port waits for a Wink before dialing.
3. PBX sends Wink back to AM1 PLUS Originate port.
4. AM1 PLUS Originate port dials.

NOTE

Conventional D.I.D. applications use Dial Pulse signaling. However, in paired operation mode, the AM1 PLUS can also dial DTMF (TT) or MF with a D.I.D. application.

5. AM1 PLUS waits for ringing to be applied to its Terminate port.
6. PBX rings dialed extension, i.e. AM1 PLUS Terminate port (last two or three digits of dialed number often determine the extension).
7. After anticipated (programmed) number of rings, AM1 PLUS Terminate port goes off-hook.
8. There is a programmable (1 to 25 sec.) cut-through delay to allow the PBX to establish a connection; see Para. 9.09.
9. Confirmation tone is sent from the AM1 PLUS Terminate port, through the PBX to the AM1 PLUS Originate port.
10. AM1 PLUS Originate port checks for the confirmation tone sent in Step 9 and also checks for Answer Supervision.
11. Confirmation tone is sent from the AM1 PLUS Originate port, through the PBX to the AM1 PLUS Terminate port.
12. AM1 PLUS Terminate port checks for the confirmation tone sent in Step 11.
13. Conversation time (optional).
14. If conversation time has been programmed, Steps 9 thru 12 will be repeated after the conversation time.
15. Both AM1 PLUS Originate and Terminate port go on-hook.

15.05 DIRECT INWARD DIALING (D.I.D.), continued

Setup

The Pause-for-Wink command must be the first digits entered in the Dialed Number Field. In the Dialed Number Field (Para. 10.06):

1. Press [SHIFT,D][1,ESC][SHIFT,D][ETR/STP LINE,C] to enter an "EC", Pause for Wink.
2. Press number keys to enter desired number to be dialed. Display will read: "EcXXXXXXX" where XXXXXXX is dialed number.

Specifications

AM1 PLUS specifications with respect to D.I.D.:

A. AM1 PLUS can be programmed to go off-hook (close loop), wait for a wink, and send desired string of dial pulses.
B. The wink must be at least 100 ms long to be recognized.
C. If the wink is longer than 1,500 ms (1.5 sec), the AM1 PLUS will start to dial 1.5 sec after the initiation of the wink (detection of reverse battery).
D. For winks between 100 ms and 1,500 ms, the AM1 PLUS starts dialing immediately after receiving the wink.
E. AM1 PLUS will wait for a wink 1 to 30 sec (as programmed with Dial Tone Fail parameter in Para. 10.10) before aborting the call.

15.06 FXO/FXS COMPATIBILITY WITH T1 LINES

On most interexchange carrier switches, there is a need for the T1 channels to be compatible with Loop/Ground Start type of signaling rather than E&M signaling. The digital units (AM1 PLUS-D, AM1T1-1 and AM1T1-2) normally operate with E&M signaling.

To change a digital unit to emulate FXO Ground Start signaling:

In the Dialed Number Field (Para. 10.06), enter an "A" as the first digit.

Note the following:

A. The selection of Ground Start type signaling is made on a line-by-line basis.
B. Only use this feature for T1 Originate Ports.
C. Do not use "A" as the first digit of an analog Originate Port.
D. The Originate Port A and B signaling bits will be inverted from their normal (E&M) logic. See table below:

ORIGINATE PORT LOGIC

LINE	E&M		GROUND START	
	A,B BITS	"E" LED	A,B BITS	"E" LED
IDLE (ON-HOOK)	0	OFF	1	ON
SEIZURE (OFF-HOOK)	1	ON	0	OFF

E. The Terminate Port always operates like E&M signaling.

15.06 FXO/FXS COMPATIBILITY WITH T1 LINES, continued

Also note the following:

F. If the affected Originate Port is Dial Tone Start, insert a "P" (pause) as the second digit, followed by the dialed number.
G. If the affected Originate Port is Delay Dial, insert a "D" (delay) as the second digit, followed by the dialed number.
H. An "A" inserted anywhere other than the first digit in the Dialed Number Field will be treated as a dialed digit "A".

15.07 DIGITAL (T1) UNPAIRED OPERATION

When a call is terminated to a T1 trunk, it is usually directed to a trunk group, consisting of several channels. The call is connected to the first available channel (not busy) at the time the call is made. It is not possible, therefore, to know ahead of time the channel to which the call will be terminated. In other words, the Originate and Terminate Ports cannot be paired. Therefore, Unpaired Mode of operation is used.

Reference Para. 10.03, 10.04 and 10.05 concerning making Originate and Terminate Port assignments for T1 channels. See Para. 10.11 for Paired/Unpaired Mode parameter. Reference Para. 10.13 concerning assignment of unpaired Originate/Terminate Confirmation Tone and Para. 10.15 concerning Terminate Port Delay/Wink Timing. See the EXAMPLE below for how to set up the parameters correctly. Note the following:

A. Only one-way voicepath confirmation can be made with unpaired T1 operation.
B. The confirmation tone is sent from the Terminate Port to the Originate Port.
C. The T1 Teminate Port will continue sending the programmed tone until the switch releases its equivalent M lead.

EXAMPLE: A Trunk-to-Trunk call is originated on Channel B-01 and terminated to a Trunk Group with Channels C-01 thru C-10.

Make Originate/Terminate Port assignments (Para. 10.04 and 10.05) as listed in the chart below:

LINE	1	2	3	4	5	6	7	8	9	10
ORIGINATE PORT	B-01	A-02	A-03	A-04	A-05	A-06	A-07	A-08	A-09	A-10
TERMINATE PORT	C-01	C-02	C-03	C-04	C-05	C-06	C-07	C-08	C-09	C-10

Note that the Originate Port assignments for Lines 2 thru 10 are left at the default analog port assignments, A02 thru A10; it does not matter, however, to what ports these are assigned because calls are not being originated on Lines 2 thru 10.

15.07 DIGITAL (T1) UNPAIRED OPERATION, continued

EXAMPLE, continued:

Set Paired/Unpaired Mode parameter (Para. 10.11) to "2" for Lines 01 thru 10.

Set O-T TONE parameter (Para. 10.13) to "0-0" for Lines 1 thru 10. The Terminate Port (C-01 thru C-10) that is seized will send a 1025 Hz confirmation tone to the B-01 Originate Port. The Originate Port will be expecting the 1025 Hz tone in order to confirm the voicepath and score a completed call. Actually, any of the tones listed in Para. 10.13 could be chosen, as long as the tone expected by the Originate Port matches the tone sent by the Terminate Ports in the trunk group.

Set Delay/Wink parameters (Para. 10.15) according to the timing of the digits expected to be received by the Terminate Port from the switch under test. Typical settings are listed below:

1 D-W 00300-0200
2 D-W 01500-0000

NOTE

Do not connect the AM1 PLUS-D Terminate Ports to circuits that will be sent Dial Pulses by the switch under test. A break in the incoming seizure signal (RCV signaling bit A) at the Terminate Port is interpreted as an on-hook (call aborted).

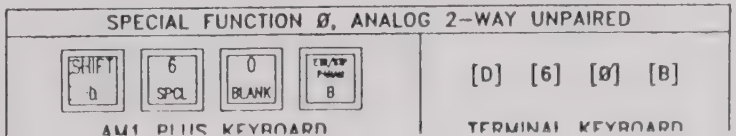
Set Originate Port Enable DIP Switch 1 to ON; set DIP Switches 2 thru 10 to OFF. See item 1 in Fig. 7-1

15.08 ANALOG UNPAIRED OPERATION: ORIGINATING/TERMINATING WITH AM1 UNIT(S) WITH TYPE 8 MODE OF OPERATION

Purpose. There is a special AM1 PLUS operating mode which enables an Analog unit to originate and terminate calls in an unpaired mode with 2-way voicepath confirmation checks. See Para. 15.09 for Analog Unpaired operation in normal mode.

How to Select. There are two (2) ways the AM1 PLUS can operate:
A. TYPE 0 Mode = the normal mode of operation
B. TYPE 8 Mode = special mode for analog unpaired with 2-way voicepath confirmation.

There is a prompt to select between TYPE 0 Mode or TYPE 8 Mode. To access the prompt, execute SPECIAL FUNCTION Ø:



Follow the instructions below for the "TYPE 0" prompt.

CALL PARAMETER/DATA DISPLAY

SPCL FUNCTION 0;

TYPE 0;

Possible entries:
- 0 = the normal mode of operation
- 8 = special mode for analog unpaired with 2-way voicepath confirmation.

Enter "8" to operate in the special Analog Unpaired Mode.
Enter "0" to return to normal mode of operation.
Press [ETR/STP PARAM,B] to enter value selected and enable the corresponding mode.

Default Parameters. When going between TYPE 8 Mode and TYPE 0 Mode, three (3) of the Line Parameters will default to certain settings. The default settings are listed in the chart below.

Read the chart chronologically from left to right:
- A. The left column of settings is for a unit in TYPE 0 Mode.
- B. The middle column of settings are the settings to which the parameters will default when going "IN" to TYPE 8 Mode.
- C. The right column of settings are the settings to which the parameters will default when going "OUT" of TYPE 8 Mode, back into TYPE 0 Mode (normal operation).

Parameter Default Settings

PARAMETER (PARA. REF.)	BEFORE TYPE 0	IN TYPE 8	OUT TYPE 0
PAIRED/UNPAIRED (10.11)	1	2	1
	2	2	1
O-T TONE (10.13)	X-X*	O-O	O-D
DIALING MODE (10.19)	1	2	1
	2	2	1
	3	2	1
	4	4	4

* X = any setting

15.08 ANALOG UNPAIRED OPERATION: ORIGINATING/TERMINATING WITH AM1 UNIT(S) WITH TYPE 8 MODE OF OPERATION, continued

Setup and Operation. Note the following concerning TYPE 8 Mode:

A. The AM1 PLUS unit can originate calls that terminate to itself or to another AM1 PLUS.
B. If the unit being called is not also originating calls, it must either be running (from a START command) or in the FINISH mode in order for the Terminate Port to answer the call. If the unit to which the call is terminated is stopped, the terminate lines will not answer an incoming call nor respond to ring signals.
C. Only two (2) dialing modes (see Para. 10.19) are allowed:
   1. Dialing Mode 2 (Dial Pulse) and
   2. Dialing Mode 4 (Touch Tone with Line Card tone generators)

   The reason for the limitation in type of dialing is that, in TYPE 8 Mode, the common tone generator must always be available to send confirmation tones. It can not therefore also be used for dialing.
D. Conversation Time (Para. 10.26) is always 0 when operating in TYPE 8 Mode.

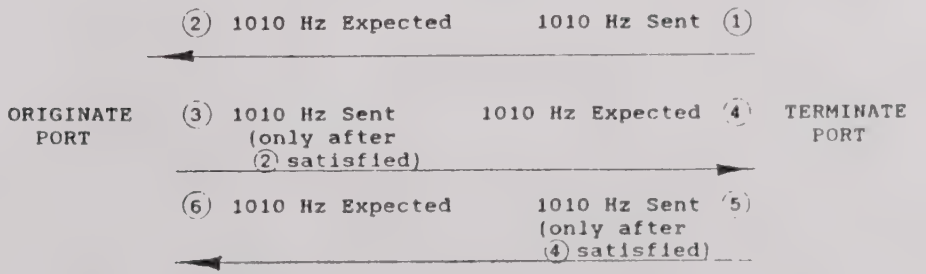
NOTE

When a STORE to EEPROM is done with SPECIAL FUNCTION A (Para. 11.09), the enabled Type 0 or Type 8 Mode of operation is also stored.

Sequence of Events. While in TYPE 8 Mode of operation, the setting of the O-T TONE parameter determines whether there will be 2-way or 1-way voicepath confirmation. Set the O-T TONE (Para. 10.13) for the desired type of voicepath confirmation. The sequence of events for each choice are given below:

A. 2-Way Voicepath Confirmation, O-T TONE 0-0 (Default Setting)

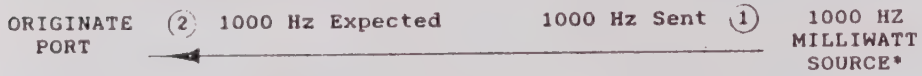
1. A series of three (3) confirmation tones are sent, two (2) from the Terminate Port and one (1) from the Originate Port. Each tone is sent @ 1010 Hz and -6 dBm for 4 sec.
2. The circled numbers in the diagram below indicate the order of events; the arrows indicate the direction of the tone.


(2) 1010 Hz Expected
1010 Hz Sent (1)
ORIGINATE PORT
(3) 1010 Hz Sent (only after (2) satisfied)
1010 Hz Expected (4)
TERMINATE PORT
(6) 1010 Hz Expected
1010 Hz Sent (5) (only after (4) satisfied)

If all three (3) tones are sent and received successfully, the Originate Port COMPLETE Data Register (Para. 13.15) will increment and the Terminate Port TERMINATIONS Data Register (Para. 13.17) will increment.

B. **1-Way Voicepath Confirmation, O-T TONE 1-0**

One (1) 1000 Hz (approximately) confirmation tone is expected by the Originate Port. Use this selection when terminating to an external milliWatt source.

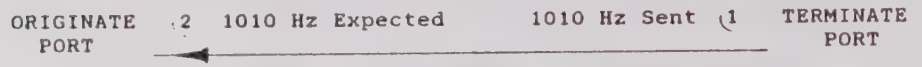


* For example, an Ameritec AM3-2C Responder

If the tone is received successfully by the Originate Port, the Originate Port COMPLETE Data Register (Para. 13.15) will increment.

C. **1-Way Voicepath Confirmation, O-T TONE 0-1**

One (1) 1010 Hz confirmation tone is sent by the Terminate Port after which the Terminate Port goes on-hook. Use this selection when the call is received from an AM1XT unit that is only equipped with TYPE 0 Mode of operation.



(unit in TYPE 0 Mode) (unit in TYPE 8 Mode)

If the Terminate Port receives ringing, answers, sends the tone, and goes back on-hook, the Terminate Port TERMINATIONS Data Register (Para. 13.17) will increment. If the Originate Port receives the tone successfully, the Originate Port COMPLETE Data Register (Para. 13.15) will increment.

D. **Two (2) 1-Way Voicepath Confirmations, O-T TONE 1-1**

One (1) 1000 Hz (approximately) confirmation tone is expected by the Originate Port.

One (1) 1010 Hz confirmation tone is sent by the Terminate Port after which the Terminate Port goes on-hook.

This mode is cases B and C above combined.

15.09 ANALOG UNPAIRED OPERATION, TERMINATING AT AN AM1 UNIT WITH TYPE 0 MODE OPERATION ONLY

TYPE 0 Mode vs. TYPE 8 Mode. See the first part of Para. 15.08 for a discussion of TYPE 0 Mode and TYPE 8 Mode of operation.

If an Analog Unpaired call originates in an AM1 PLUS (which is equipped with TYPE 8 Mode) and terminates to an AM1 unit that has TYPE 0 Mode only (not equipped with Type 8 Mode),

NO VOICEPATH CONFIRMATION CHECK CAN BE MADE.

15.09 ANALOG UNPAIRED OPERATION, TERMINATING AT AN AM1 UNIT WITH TYPE 0 MODE OPERATION ONLY, continued

To be able to make 2-way voicepath confirmation checks in Analog Unpaired operation, both the Originate Port and the Terminate Port device must be equipped with TYPE 8 Mode operation (accessed with SPECIAL FUNCTION 0 as described in Para. 15.08).

Note points below for operating Analog Unpaired in TYPE 0 Mode:

A. An Analog Terminate Port (E&M or Loop) in TYPE 0 Mode is not capable of generating a tone, making it not possible to confirm the voicepath.
B. This mode of operation is not recommended due to the complexity in assuring the coordination of parameters and determining whether or not the switch actually made a connection and when.
C. An E&M Terminate line will be held until the switch releases its "M" lead.
D. Do not terminate the call to the loop side of an E&M Originate/Loop Terminate card, found in Expansion Units AM1EXT-2, AM1E PLUS-3 and AM1EXT-3; the software does not not recognize the Terminate Port as loop in Unpaired Mode.

NOTE

See Para. 15.03 to confirm voicepath using special digits in the Dialed Number Field when terminating to an external device that sends a tone or a start dial signal.

Setup. To make Analog Unpaired calls (in TYPE 0 Mode) without voicepath confirmation, set up the Lines of the AM1 Originate and Terminate Ports as outlined below. Refer to the "Paragraph Reference" for details on setting the parameters.

ORIGINATE PORT

LINE PARAMETER PROMPT	PARAGRAPH REFERENCE	SETTING
PR=1 UNPR=2	10.11	2
O-T TONE	10.13	D-D
CONV TIME	10.26	See below

Set the Conversation Time (CONV TIME) to the sum of the times listed below:

-time the switch should take before applying ringing to the terminate line
-time required for the rings before answer (number of rings before answer programmed for Terminate Ports with Para. 10.16 prompt)
-time the terminate line will be off-hook (programmed for Terminate Ports with Delay 1 time in Para. 10.15 prompt)

TERMINATE PORT
(set all possible Terminate Ports this way)

LINE PARAMETER PROMPT	PARAGRAPH REFERENCE	SETTING
PR=1 UNPR=2	10.11	2
O-T TONE	10.13	D-D
TIMEOUT-RNG	10.16	See below
1 D-W	10.15	See below

Set the Ring (RNG) parameter (Para. 10.16) to the desired number of rings (1 to 8) to be received by the Terminate Port before it answers (goes off-hook)

Set the Delay 1 parameter (Para. 10.15) to the time desired for the Terminate Port to be off-hook (after which it will go on-hook).

NOTE

If the Delay 1 parameter were set at 00000, the Terminate Port would not answer (because off-hook for 0 seconds is the same as not answering!).

Data Register Incrementation. When calls are made with the setup as descried above, the Originate and Terminate Data Registers will increment as described below:

Originate Port: The Completed Calls Data Register (Para. 13.15) will increment if the proper start dial signal (for example, Dial Tone) is received.

Terminate Port: The Terminations Data Register (Para. 13.17) will increment each time the Terminate Port receives enough rings to answer the call per the TIMEOUT-RNG parameter (Para. 10.16).

15.10 VOICEPATH CONFIRMATION TONE FAILURE ANALYSIS

If there is a failure with the voicepath confirmation tone, it will be recorded in a Data Register and, if the Basic Unit is equipped with an RS232 Port, the type of tone failure can be indicated in a Real Time Error Report.

The NO TONE Data Register (Para. 13.13) will increment for each voicepath confirmation tone failure.

One of the following Real Time Error Reports is output for a voicepath confirmation tone failure (taken from Fig. 14-6):

```
 6)  LINE 16 NO CONF TONE 1B  @ 09:12 04/07/88 (LEVEL)
 7)  LINE 09 NO CONF TONE 2B  @ 10:51 04/07/88 (FREQUENCY)
 8)  LINE 30 NO CONF TONE 1E  @ 11:21 04/07/88 (FREQUENCY)
 9)  LINE 04 NO CONF TONE 2E  @ 13:01 04/07/88 (FREQUENCY)
10)  LINE 08 3 CONF TRIES RQD @ 13:07 04/07/88
11)  LINE 01 NO TONE          @ 14:43 04/07/88 DIGIT=011
```

Read Para. 14.08, 6) thru 11) for explanations of the above Real Time Error Reports. Reports (6) thru (10) are output with Paired Mode of operation; the NOTE in Para. 10.26 defines the codes 1B, 2B, 1E and 2E. Report (11) is output in Unpaired mode.

Read Para. 10.29 with respect to the criteria for both successful and failed voicepath confirmation checks and the reports that are delivered to indicate the results.

15.10 VOICEPATH CONFIRMATION TONE FAILURE ANALYSIS, continued

Type of Tone Failure. Real Time Error Report will indicate "(LEVEL)" or "(FREQUENCY)" as the reason for the voicepath confirmation failure. See below for how the AM1 PLUS tests the incoming tone for "LEVEL" and "FREQUENCY", in both Paired Operation and Unpaired Operation.

AM1 PLUS Tone Detection, Paired Operation. The AM1 PLUS first tests an incoming confirmation tone for proper LEVEL and then for correct FREQUENCY. The sequence for Paired Operation (Para. 10.11) is described below:

1. When all of the dialed digits have been outpulsed, the Terminate Port looks for ringing voltage or a seizure (unless the confirmation tone was set for 1004 Hz from an external source).
2. When ringing is detected on the Terminate Port, that line goes off-hook on the programmed ring and waits the Cut-Through Delay Time (Para. 9.09) for line stabilization.
3. The Terminate Port then sends a 20 ms tone of the programmed confirmation tone (Para. 10.12) at -6 dB (tone sent from the Terminate Port to the Originate Port).
4. The Originate Port samples the tone for 20 ms for proper LEVEL. A LEVEL -21 dBm or higher will be acceptable (levels a few dB lower may also be acceptable). If the LEVEL is too low, the call is aborted at this point and the NO TONE Data Register (Para. 13.13) is incremented and the Real Time Error Report NO CONF TONE 1B (Fig. 14-6, 6) is output.

   NOTES

   -If the LEVEL is too low on the first try and more than one confirmation tone try is programmed (Para. 10.29), the tone will be sent repeatedly up to the allowable number of tries until the LEVEL is received correctly or the call is aborted (last try also fails).
   -If running in Automatic Stop-on-Trouble Mode (Para. 9.03), and there is a failure of the confirmation tone check, the line will stay off-hook while the call is stopped and the tone will be sent periodically to enable the user to track down the discrepancy(ies) in the voicepath.

5. If the LEVEL is acceptable in Step 4, the tone will last a total of 120 ms without a break. If the LEVEL is not acceptable in Step 4, the tone will cease after the first 20 ms and the call will be aborted.
6. If the LEVEL is acceptable in Step 4, the Originate Port reads the FREQUENCY of the tone, sampling for 100 ms. The counts are compared to the expected counts per the programmed confirmation tone (Para. 10.12) for that line.

   If the FREQUENCY is not acceptable, the call is aborted, the NO TONE Data Register (Para. 13.13) is incremented and the Real Time Error Report NO CONF TONE 1B (Fig. 14-6, 6) is output.

AM1 PLUS Tone Detection, Paired Operation, continued.

6. (continued) The acceptable frequencies are listed below:

FREQUENCY CODE	NOMINAL FREQUENCY	ACCEPTABLE RANGE
1	697 Hz	680 - 720 Hz
2	770 Hz	750 - 800 Hz
3	852 Hz	820 - 890 Hz
4	941 Hz	910 - 970 Hz
5	1209 Hz	1170 - 1250 Hz
6	1336 Hz	1290 - 1380 Hz
7	1477 Hz	1420 - 1530 Hz
8	1633 Hz	1550 - 1690 Hz

7. If programmed for 2-way voicepath confirmation (Para. 10.12) and the FREQUENCY of the tone is acceptable in Step 6, the Originate Port will then send the same tone to the Terminate Port. The Terminate Port also checks the tone for LEVEL and FREQUENCY as described in Steps 4 thru 6.

NOTE

For 2-way confirmation, both the Terminate-to-Originate and the Originate-to-Terminate Confirmation Tones must be received correctly within the same attempt in order to successfully confirm the voicepath.

8. If Conversation Time (Para. 10.26) is programmed, Steps 3 thru 6 are repeated just before the end of the Conversation Time.
9. At the end of Conversation Time, both the Terminate and the Originate Ports simultaneously go back on-hook.

AM1 PLUS Tone Detection, T1 Unpaired Operation. See Para. 15.07 for description of digital T1 unpaired operation. Only 1-way voicepath confirmation is possible for this mode. The AM1 PLUS (Originate Port only) tests for the incoming voicepath confirmation tone as listed below:

1. Every second for the duration of the TIMEOUT parameter setting (Para. 10.16), the Originate Port looks for the confirmation tone.
2. The first 20 ms is dedicated to sensing the LEVEL. A level of -21 dBm or higher will be acceptable.
3. If the LEVEL is acceptable, the FREQUENCY is read, sampling for 100 ms. The counts are compared to the expected counts per the programmed confirmation tone (Para. 10.13) for that line.
4. If the FREQUENCY check passes in Step 3, the Completed Calls Data Register is incremented and the Originate Port goes on-hook.
5. If either the LEVEL or the FREQUENCY check fails, the Originate Port will do another check a second later.

15.10 VOICEPATH CONFIRMATION TONE FAILURE ANALYSIS, continued

AM1 PLUS Tone Detection, T1 Unpaired Operation, continued.

5. (continued) The acceptable frequencies are listed below:

FREQUENCY CODE	NOMINAL FREQUENCY	ACCEPTABLE RANGE
0	1025 Hz	1000 - 1060 Hz
1	1150 Hz	1130 - 1190 Hz
2	1275 Hz	1250 - 1310 Hz
3	1400 Hz	1380 - 1440 Hz
4	1525 Hz	1500 - 1560 Hz
5	1650 Hz	1630 - 1690 Hz
6	1775 Hz	1750 - 1810 Hz
7	1900 Hz	1880 - 1940 Hz
8	2025 Hz	2000 - 2060 Hz
9	2150 Hz	2130 - 2190 Hz
A	2275 Hz	2250 - 2310 Hz
B	2400 Hz	2380 - 2440 Hz
C	900 Hz	880 - 940 Hz

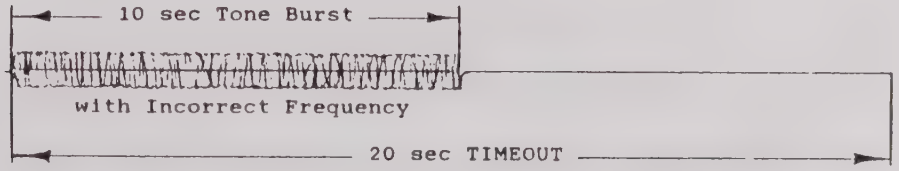
6. The Originate Port will continue to do checks each second up to the programmed TIMEOUT (Para. 10.16) until:
   A. A successful LEVEL and FREQUENCY check is made on the same attempt or
   B. A failed check is recorded on the last attempt, at which time the Real Time Error Report will indicate the type of failure on the last attempt.

NOTE

Be sure to program the TIMEOUT such that the confirmation tone should still be present at the end of the TIMEOUT period. See the EXAMPLE below.

EXAMPLE: This example shows how an erroneous result could be obtained if the TIMEOUT period is set for too long a time with T1 Unpaired Operation.

A 10 sec. voicepath confirmation tone burst is received by the Originate Port. The Level of the tone is acceptable, but the Frequency is not correct. The TIMEOUT (Para. 10.16) is 20 sec.



Because the Frequency of the tone is not correct, the AM1 PLUS will continue to sample the tone, trying to sense a correct Level and Frequency. On the last attempt, just before the 20 sec. timeout, the report will indicate failure due to low Level, because the tone will not be present at that time.

If the TIMEOUT had been set to less than 10 sec, the report would have correctly indicated that the failure was due to an incorrect Frequency.

udio Indication of Type of Failure. If there is a confirmation one failure, the type of failure can be determined by listening o the line with the Audio Monitor patch cord connected between ither the Originate Port or Terminate Port and the Audio Monitor ack (typical connection shown with item 5 in Fig. 4-1). Listen or the length of time the confirmation tone lasts:

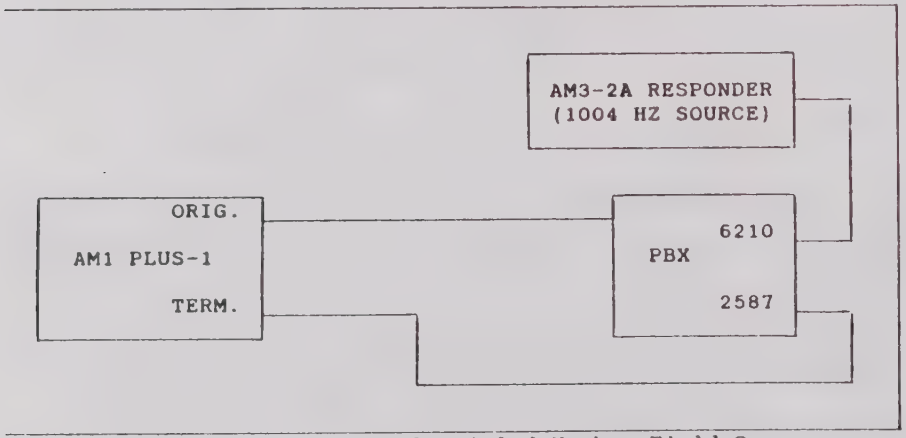
A. If the tone failure is due to a low LEVEL, only a short (20 ms) tone will be heard (abruptly cut off).
B. If the tone failure is due to an out-of-tolerance FREQUENCY, the full 120 ms tone will be heard.

his audio method of determining the type of tone failure is specially useful if the Basic Unit is not equipped with an RS232 ort and therefore does not have Real Time Error Reports to ndicate the type of failure.

5.11 EXAMPLE DIALED NUMBER FIELD CALL SEQUENCE

ee Para. 10.06 for explanations of the possible entries in the ialed Number Field.

XAMPLE: An AM1 PLUS-1 Analog Basic Unit is connected to a PBX. xtension 6210 of the PBX is connected to an Ameritec AM3-2A 2-ire Commandable Responder, a milliWatt (1004 Hz) source. Extension 2587 of the PBX is connected to the Terminate Port of the M1 PLUS-1. Figure 15-10 illustrates the setup.



igure 15-10. Setup for Example Dialed Number Field Sequence

n this example, the parameters are set as listed below:

A. WAIT (-) Time parmeter setting (Para. 9.06) is "03" sec.
B. PAIRED/UNPAIRED MODE (Para. 10.11) is set to "1" (Paired Mode).
C. Confirmation Tone parameter setting (Para. 10.12) is set to "12" (697 Hz tone, 2-way confirmation).
D. Dialing Mode (Para. 10.19) is set to "1" (Touch Tone, using shared tone generator).
E. Note that the Conversation Time parameter setting (Para. 10.26) is ignored when the "ESCAPE" function is used.

15.11 EXAMPLE DIALED NUMBER FIELD CALL SEQUENCE, continued

Digits are entered in the Dialed Number Field (Para. 10.06) as shown below. There are a total of 27 digits, 16 entered into the first field and 11 entered into the second field.

CALL PARAMETER/DATA DISPLAY

1st field 001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016

2587EFP6210EE-FE;

2nd field 017 018 019 020 021 022 023 024 025 026 027 028 029 030 031 032

-#1EE----#4 :

The purpose of each of the Dialed Number Field entries is listed below:

DIGITS	FUNCTION
2587	Dial PBX extension 2587
E	Confirm voicepath with programmed tone
F	Hook Flash
P	Pause for Dial Tone
6210	Dial PBX extension 6210 (with AM3-2A Responder)
EE	Look for 1004 Hz*
-	Wait for 3 seconds (to allow Responder to finish sending 1004 Hz)
F	Hook Flash
E	Confirm voicepath with programmed tone
-	Wait 3 seconds
#1	Command Responder to send 1004 Hz at -10 dBm for 10 seconds
EE	Look for 1004 Hz
----	Wait 12 seconds (to allow Responder to finish sending 1004 Hz)
#4	Command Responder to go back on-hook

* Note that when the AM3-2A Responder goes off-hook initially, it sends 3 seconds of 1004 Hz.

After the START command, the line programmed with the above Dialed Number Fields follows the sequence listed below:

1. Originate Port goes off-hook
2. Originate Port detects Dial Tone
3. Digits 2587 are outpulsed

15.11 EXAMPLE DIALED NUMBER FIELD DIALED SEQUENCE, continued

Sequence after START command, continued:

4. TIMEOUT period (Para. 10.16) allowed for the first ring to be detected on the Terminate Port
5. Terminate Port answers (goes off-hook) after programmed number of rings (Para. 10.16)
6. Cut-Through Delay Time (Para. 9.09) elapses to allow the line to stabilize and the switch to establish a voicepath
7. 697 Hz tone is sent from the Terminate Port to the Originate Port.
8. If the Originate Port determines the incoming tone to be acceptable, the Originate Port will send a 697 Hz tone back to the Terminate Port.
9. If the Terminate Port determines the incoming tone to be acceptable, the call sequence will continue.
10. Switch hook FLASH, duration set per Para. 10.28
11. PAUSE for Dial Tone
12. If Dial Tone is detected, the digits 6210 are outpulsed
13. Originate Port waits programmed TIMEOUT period (Para. 10.16) for 1004 Hz confirming tone to be received
14. When 1004 Hz tone is detected, the line will "wait" for three seconds and then switch hook FLASH.
15. At this time, the Originate Port, the Terminate Port and the Responder line are all conferenced together.
16. Steps 7, 8 and 9 are repeated.
17. Three (3) seconds of "wait"
18. Digits #1 are outpulsed (to command Responder to send 1004 Hz).
19. Originate Port waits programmed TIMEOUT period (Para. 10.16) for 1004 Hz confirming tone to be received
20. After 1004 Hz detected properly, 12 seconds of "wait"
21. Digits #4 are outpulsed (to command Responder to go on-hook)
22. Originate and Terminate Ports simultaneously go back on-hook.
23. Intercall or Call-to-Call Time (Para. 10.18) elapses
24. The sequence is repeated.

Real Time Error Reports. Some possible Real Time Error Reports for the above scenario are listed below:

After 2587 is dialed and the Terminate Port answers, if the level were too low of the voicepath confirmation tone sent from the Terminate Port to the Originate Port:

```
LINE 01 NO CONF TONE 1B  @ 09:12 04/07/88 DIGIT=005 (LEVEL)
```

If the Responder did not send the initial 1004 Hz after dialing it up with 6210:

```
LINE 01 NO TONE          @ 09:14 04/07/88 DIGIT=013 (LEVEL)
```

If the Responder did not send the 10 seconds of 1004 Hz after the #1 command:

```
LINE 01 NO TONE          @ 09:16 04/07/88 DIGIT=021 (LEVEL)
```

16. THEORY OF OPERATION AND BLOCK DIAGRAMS

16.01 INTRODUCTION

This section gives an overall view of how the circuitry operates and how the general functional components are interconnected, both for an AM1 PLUS in general and also for the different types of units.

The paragraphs in this section are listed below:

16.02 General Description of Circuit Operation
16.03 Block Diagrams of Individual Units
16.04 AM1 PLUS Operation

16.02 GENERAL DESCRIPTION OF CIRCUIT OPERATION

System operation is controlled by the Z80 microcomputer card which operates under an operating program written in assembly language and stored in non-volatile read-only memory (PROM). Because of the digital CMOS design, the AM1 PLUS requires no calibration, adjustment or special cooling.

All timing is derived from a crystal-controlled 250 nano-second clock. Common tone frequencies and amplitudes are generated by a separate microcomputer contained on the miscellaneous PC card; these tones are gated to the appropriate line(s) as required by the master microcomputer. Each of the line cards of AM1 PLUS-1, AM1E PLUS-1 and AM1E PLUS-3 units have a touch tone generator dedicated exclusively to its own Originate line.

On-hook/off-hook and dial pulses are accomplished by means of an optically-coupled switch associated with each line and under microcomputer control.

Specific operation of each line is determined by call parameter values stored in tables in Random Access Memory (RAM). There is one table for the Unit in general and one for each Line. Upon system turn-on (cold start), the tables are loaded with parameter values from EPROM (factory-set) or from one of four (4) EEPROM locations (user-selected). The Unit Parameters and Line Parameters may be modified "on line" from the front panel keyboard or by loading from peripheral units (cassette or remote terminal).

A Functional System Block Diagram is shown in Fig. 16-1.

16.03 BLOCK DIAGRAMS OF INDIVIDUAL UNITS

Block Diagrams of individual units are shown in Fig. 16-2 thru Fig. 16-5.

Analog Basic Units (Fig. 16-2). Note that each Analog Basic Unit has 10 dual-port line cards. The AM1 PLUS-1 Basic Unit with Loop/Ground Start interface is described in detail in Section 5. See Section 6 for description of the AM1 PLUS-2 E&M Basic Unit.

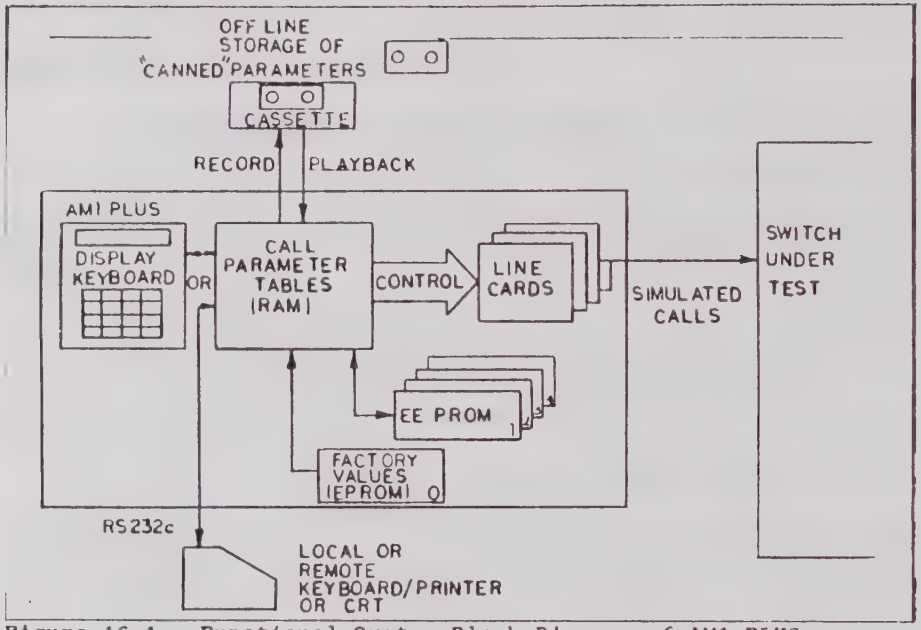


Figure 16-1. Functional System Block Diagram of AM1 PLUS

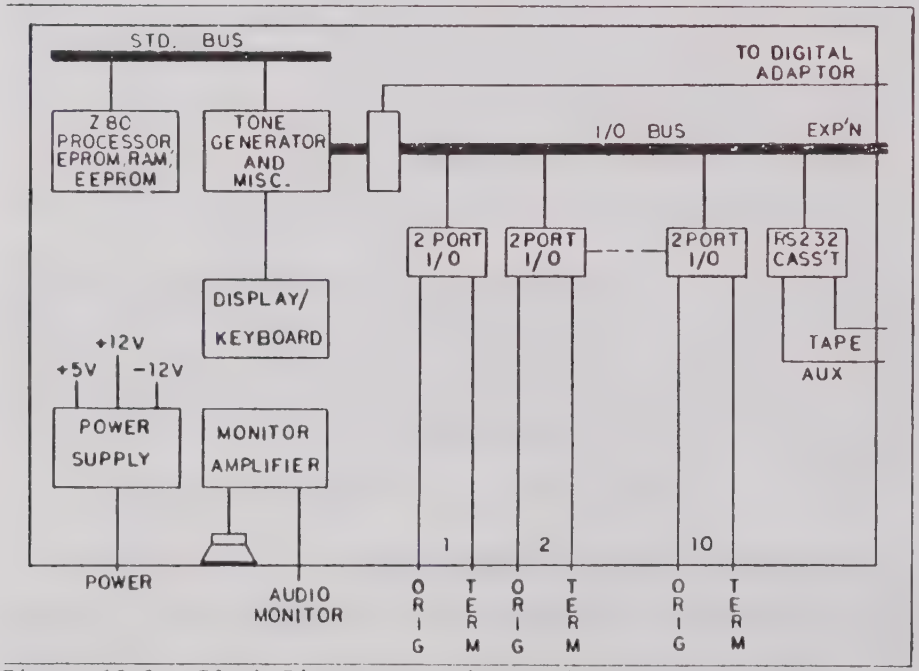


Figure 16-2. Block Diagram: Analog Basic Units, AM1 PLUS-1, -2

16.03 BLOCK DIAGRAMS OF INDIVIDUAL UNITS, continued

Digital T1 Basic Unit (Fig. 16-3). Note that this Basic Unit has three (3) T1 ports. The AM1 PLUS-D Basic Unit is described in detail in Section 7.

Expansion Unit (Fig. 16-4). This becomes a continuation of the I/O bus of the Basic Unit to which it is connected. 20 dual-port lines are added to those of the Basic Unit. Various types and combinations of port interfaces are possible with Expansion Units, as discussed in Para. 8.02 thru Para. 8.06.

T1 Adaptors (Fig. 16-5). The AM1T1-1 (left half of block diagram) is connected to one Analog Basic Unit and has three (3) T1 ports. The AM1T1-2 is connected to two (2) Basic Units and is really two (2) AM1T1-1 units in a single package.

16.04 AM1 PLUS OPERATION

The AM1 PLUS generates telephone calls to the switch under test as programmed with Unit Parameters (Section 9) and Line Parameters (Section 10). See Para. 13.04 and Table 13-1 for discussion of a typical call sequence. Timing of the call sequence and call rate considerations are covered in Para. 15.02 and Table 15-1. See Para. 15.10 concerning how the AM1 PLUS analyzes the acceptability of an incoming voicepath confirmation tone. Note that the default start dial signal (Dial Tone or Wink) can be overridden by programming "immediate" dial; see Para. 10.07,A,5. Test results are stored in Data Registers (Para. 13.07 to 13.17).

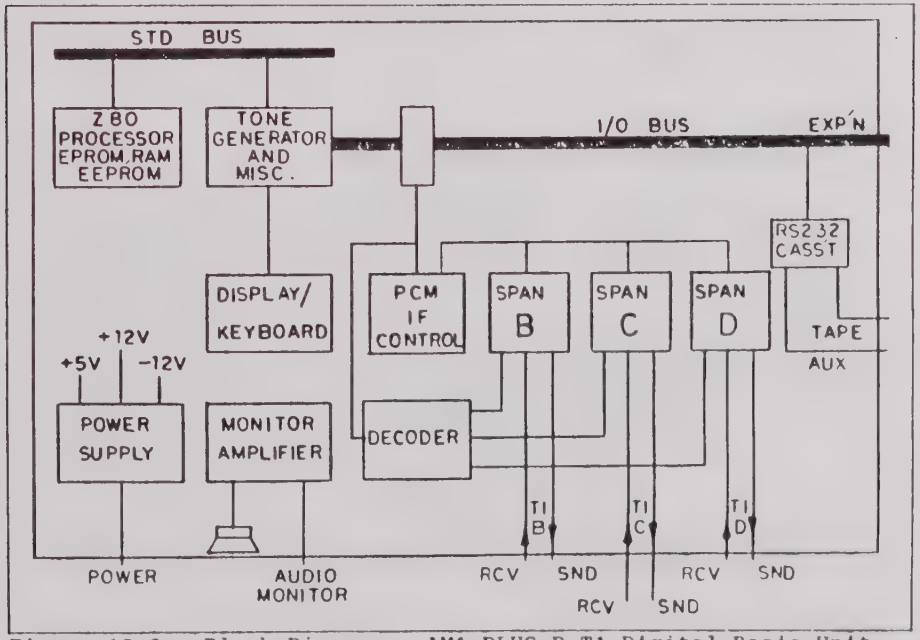


Figure 16-3. Block Diagram: AM1 PLUS-D T1 Digital Basic Unit

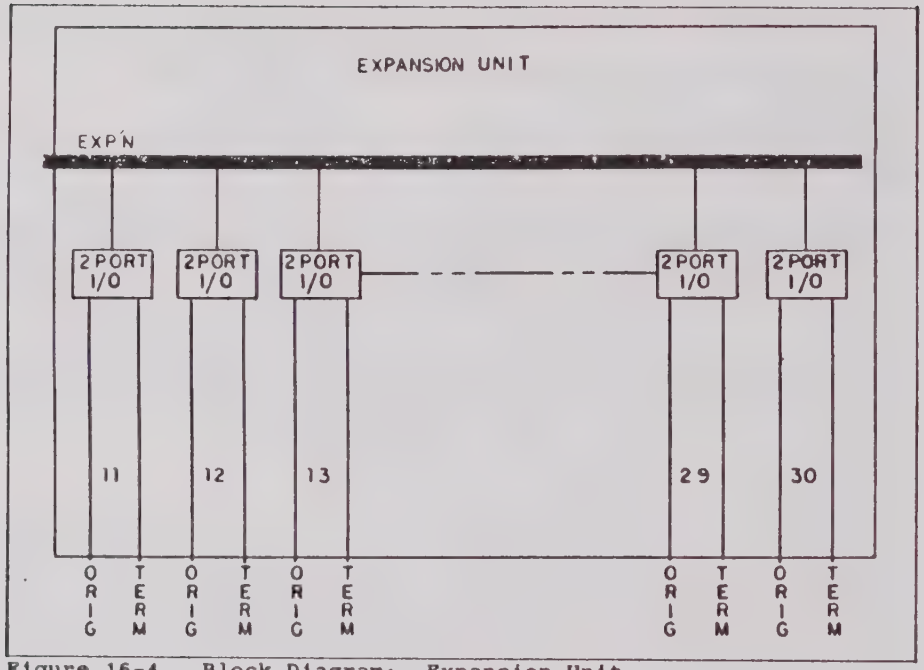


Figure 16-4. Block Diagram: Expansion Unit

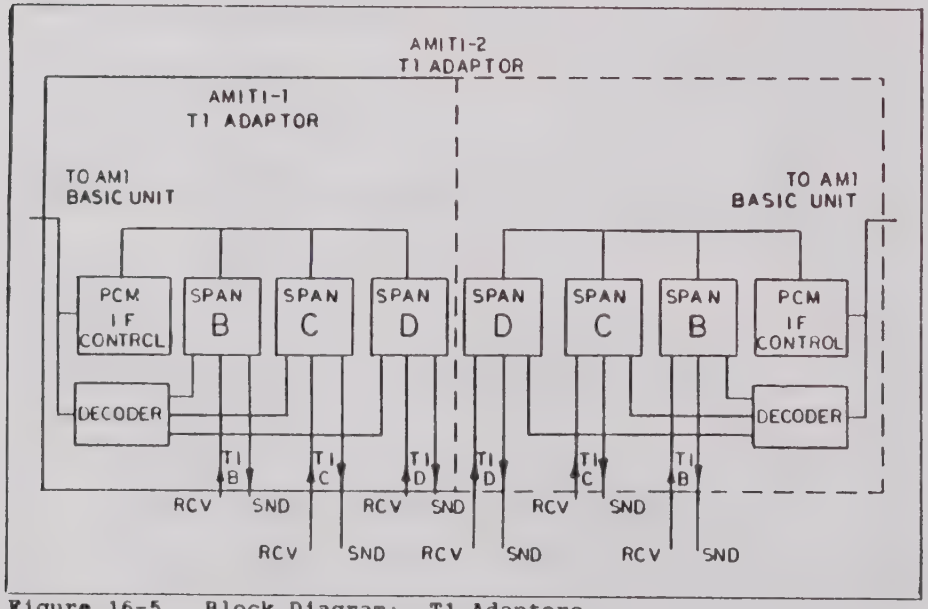


Figure 16-5. Block Diagram: T1 Adaptors

17. ORDERING INFORMATION

This section contains a list of equipment available for the AM1 PLUS Bulk Call Generator System. The Model Number and a description is listed for each item. This list can be used for ordering by making a photo copy of the list and filling in the "QUANTITY" blanks next to the items ordered. Current Price List is available upon request. Order from:

AMERITEC CORPORTATION
760 Arrow Grand Circle
Covina, California 91722
U.S.A.
Telephone: (818) 915-5441
Telex: 754958
FAX: (818) 915-7181

See Fig. 1-1 thru 1-9 and Fig. 19-1 for illustrations of Basic Units, Expansion Units and T1 Adaptor Units.

See Table 12-3 for references to illustrations and application information on Cables and Panel Adaptors.

MODEL	QUANTITY	DESCRIPTION
BASIC UNITS ANALOG		
AM1 PLUS-1 _ _*	_____	Bulk Call Generator with enhanced features including: DTMF tone gen. per orig. line, tone detector per orig. line for identifying line busy and reorder; avg. dial tone delay and avg. time to answer data registers; store & recall and user programmable "power-up" parameters. Equipped with 10 loop start/ground start originate ports and 10 loop terminate ports.
AM1 PLUS-2 _ _*	_____	Same as AM1PLUS-1, but, equipped with 10 E&M originate ports and 10 E&M terminate ports. All features noted in the AM1 PLUS-1 apply except the DTMF tone gen. and tone detector per orig. line.
AM1 PLUS 20/20 - _ _ *	_____	Same as AM1PLUS-1, but, with 20 originate and 20 terminate Loop Start ports. Originate ports are loop start only, NOT ground start.

* See Table 1-1 for number codes to complete the Model Number, specifying input power and mounting (portable or rack mount).

MODEL	QUANTITY	DESCRIPTION
BASIC UNIT DIGITAL		
AM1 PLUS-D _ _*	_____	Tri-Span Digital Bulk Call Generator equipped with 30 originate and 30 terminate channel selections. Will support analog expansion units.
ADAPTOR UNITS		
AM1T1-1 _ _*	_____	Single T1 Tri-Span Digital adaptor unit for use with one AM1PLUS (-1XX or -2XX) unit. (NOT AVAILABLE FOR AM1 PLUS 20/20).
AM1T1-2 _ _*	_____	Dual T1 Tri-Span Digital adaptor unit for use with two AM1PLUS (-1XX or -2XX) units. (NOT AVAILABLE FOR AM1 PLUS 20/20).
EXPANSION UNITS**		
AM1E PLUS-1 _*	_____	Expansion Unit, equipped with 20 originate loop start/ground start and 20 terminate loop type lines. Features are identical to AM1PLUS-1. Includes expansion cable for connection to AM1PLUS.
AM1EXT-2 _*	_____	Expansion Unit, equipped with 20 originate (2 or 4 wire E&M) and 20 terminate (loop) ports. Includes expansion cable for connection to AM1PLUS.
AM1E PLUS-3 _*	_____	Expansion Unit, equipped with 12 loop start/gnd. start originate ports (as used in the AM1E PLUS-1) and 8 E&M originate ports (as used in the AM1EXT-2). All terminate ports are loop type. Includes expansion cable for connection to AM1PLUS.
AM1EXT-4 _*	_____	Expansion Unit, equipped with 20 originate (2 or 4 wire E&M) and 20 terminate (2 or 4 wire E&M) ports. Includes expansion cable for connection to AM1PLUS.

* See Table 1-1 for number codes to complete the Model Number, specifying input power and mounting (portable or rack mount).
** Any AM1 Expansion Unit can be connected to a "PLUS" Basic Unit.

MODEL	QUANTITY	DESCRIPTION
OPTIONS		
28-0006	_____	RS232c Interface. Used for interfacing AM1XT to printer, CRT, modem, etc.
28-0005	_____	RS232c and Cassette Interface. Same as 28-0006 (above), Plus interfaces to 24-0002 Cassette Recorder.
28-0079	_____	RS232 Interface with software selectable baud rate.
ACCESSORIES		
24-0016	_____	Portable Printer (includes cable and one roll of paper). Requires Option 28-0005, 28-0006 or 28-0079.
24-0002	_____	Cassette Recorder (includes cable and one cassette). Requires Option 28-0005. Used for storage and loading of unique call parameters.
26-0016	_____	Printer Paper (roll)
26-0001	_____	Cassette (each)
87-0002	_____	Transit Case. Rugged, custom transport container for two AM1 type units.
48-0012	_____	Universal RS232 Port Cable. Connectorized on one end.
48-0084	_____	RS232 Port Cable. Connectorized on both ends. Compatible with most CRT and Printers e/w 25 pin female conn.
48-0015	_____	Chaining Cable. Used to "stack" multiple Basic/Expansion units up to 15 sets. Requires Option 28-0005, 28-0006, or 28-0079 for each AM1 PLUS basic unit.
88-0001	_____	Replacement Battery for memory board (P/N 28-0033)
CONNECTING CABLES		
FOR LOOP ORIGINATE / LOOP TERMINATE PORTS		
48-0004	_____	Dual Line Cable (spade lug end), 10'
48-0005	_____	Dual Line Cable (minigator end), 10'
48-0006	_____	Dual Line Cable (sleeve end), 10'
48-0080	_____	Dual Line RJ11 Cable. Two RJ11 conn. for conn. to two RJ11 phone jacks.

MODEL	QUANTITY	DESCRIPTION
CONNECTING CABLES		
	FOR E&M ORIGINATE / LOOP TERMINATE PORTS	
48-0020	_____	Dual Line Cable (open end), 10'
48-0021	_____	Dual Line Cable (minigator end), 10'
48-0022	_____	Dual Line Cable (sleeve end), 10'
	FOR E&M ORIGINATE / E&M TERMINATE PORTS	
48-0039	_____	Dual Line Cable (open end), 10'
48-0040	_____	Dual Line Cable (minigator end), 10'
48-0041	_____	Dual Line Cable (sleeve end), 10'
	FOR DIGITAL T1 PORTS	
48-0047	_____	Bantam to Bantam, 6', Patch Cord Two required for each T1 Port
48-0048	_____	Bantam to 310 Plug, 6', Patch Cord Two required for each T1 Port
PANEL MOUNT ADAPTORS FOR AM1PLUS-1, AM1E PLUS-1, AM1E PLUS-3 and AM1 PLUS 20/20 ONLY		
48-0018	_____	50 Pin, female, AMP type connection Adaptor, (one required per AM1 PLUS-1, two required per AM1E PLUS-1).
48-0018-12	_____	Same as 48-0018, but, for the 12 AM1E PLUS-3 loop ports.
48-0103	_____	Similar to the 48-0018, but, for 20 originate and 20 terminate ports of the AM1 PLUS 20/20 unit.
48-0087	_____	Male AMP 25pr to open end (mates to 48-0018, 48-0018-12 or 48-0103).
48-0088	_____	Male AMP 25pr to male AMP (mates to 48-0018, 48-0018-12 or 48-0103).
48-0089	_____	Male AMP 25pr to female AMP (mates to 48-0018, 48-0018-12 or 48-0103).
ADAPTOR FOR RACK MOUNT AM1EXT-2 ONLY		
36-0002	_____	50 Pin, female, AMP type connection panel, (three connectors) 20 orig / 20 term ports

MODEL	QUANTITY	DESCRIPTION
ADAPTOR FOR RACK MOUNT AM1 PLUS-2 & AM1EXT-4 ONLY		
36-0003	_____	64 Pin, female, AMP type connection panel, (two connectors) 10 orig / 10 term ports
36-0004	_____	64 Pin, female, AMP type connection panel, (four connectors) 20 orig / 20 term ports
UPGRADES OF OLDER AM1 UNITS TO PLUS UNITS.		
RET AM1-1 +	_____	Factory upgrade of AM1XT-1 to AM1 PLUS-1.
RET AM1-1S +	_____	Factory upgrade of AM1XT-1 "software only" to AM1 PLUS-1.
RET AM1E-1 +	_____	Factory upgrade of AM1EXT-1 to AM1E PLUS-1.
RET AM1-2 +	_____	Factory upgrade of AM1XT-2 to AM1 PLUS-2.
RET AM1-D +	_____	Factory upgrade of AM1XT-D to AM1 PLUS-D.

AN AM1 (NOT AM1XT) CAN ALSO BE UPGRADED TO A PLUS UNIT

18. WARRANTY AND SERVICE POLICY

18.01 WARRANTY

Ameritec Corp warrants that its electronic instrument products are manufactured to the highest commercial standards and are free of any defects in material or workmanship. For a period of one (1) year from shipment, Ameritec will repair without charge to the original purchaser any unit which upon inspection by Ameritec proves to be defective. This warranty is the sole warranty offered by Ameritec and is in lieu of all other warranties expressed or implied and all other obligations or liabilities including claims of consequential damage.

Date of Manufacture. The date of that an Ameritec unit was manufactured can be determined from the Serial Number. The Serial Number on the Identification Label (item 13 in Fig. 4-1) is a six-digit number, coded as follows:

first two digits = week (01 thru 52) of manufacture
second two digits = year of manufacture
third two digits = identification number (00 thru 99) to distinguish between units

EXAMPLE: A unit with Serial Number 118847 was manufactured the 11th week of 1988.

18.02 SERVICE POLICY

In the event of malfunction, call or write the Ameritec factory and obtain return authorization. Return the unit to Ameritec freight prepaid with a note enclosed listing:

1. Return authorization number
2. Return shipment address
3. Name and telephone number of person familiar with the problem
4. Brief description of problem

The unit will be repaired and returned freight prepaid.

18.03 SERVICE PHILOSOPHY

Ameritec products are designed utilizing modular plug-in printed circuit board construction. Service is accomplished by PC Board replacement and can normally be accomplished in 5 minutes or less. See Appendix D for maintenance details.

AMERITEC CORPORTATION
760 Arrow Grand Circle
Covina, California 91722
U.S.A.

Telephone: (818) 915-5441
Telex: 754958
FAX: (818) 915-7181

19. AM1 PLUS 20/20 BASIC UNIT

The AM1 PLUS 20/20 Basic Unit has 20 dual-port lines with 20 Loop Originate lines and 20 Loop Terminate Lines in a single compact package. The purpose of this unit is to meet the need of the user for which the AM1 PLUS-1 Basic Unit has too few lines (10).

The AM1 PLUS 20/20 is illustrated in Fig. 19-1; it has 10 identical Line Cards which are installed behind the front panel. Each Line Card has two (2) dual-ports with Loop Originate and Loop Terminate lines. Note that the upper ports are odd-numbered and the lower ports are even-numbered.

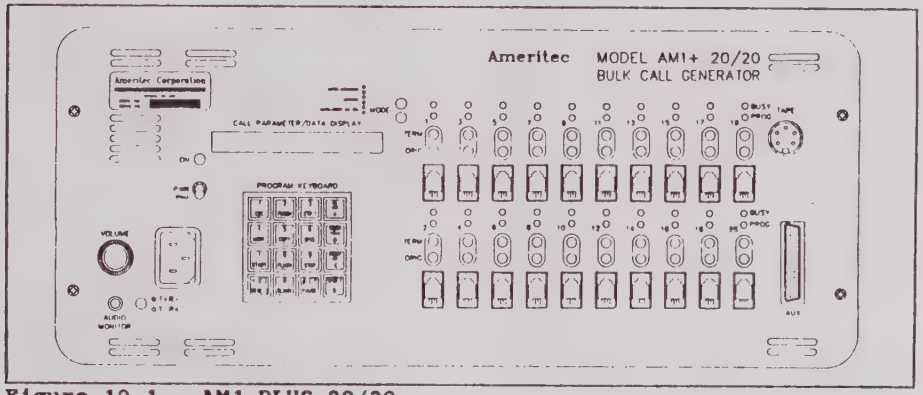


Figure 19-1. AM1 PLUS 20/20

The information in Section 5 for the AM1 PLUS-1 also applies to the AM1 PLUS 20/20 except as noted below:

A. There are twice as many lines (20) in this densely-packaged unit compared to the AM1 PLUS-1 Basic Unit.
B. An Expansion Unit can <u>not</u> be connected to an AM1 PLUS 20/20. A T1 Adaptor Unit can <u>not</u> be connected to an AM1 PLUS 20/20.
C. One or more AM1 PLUS 20/20 units can be included in a chain, using the optional RS232 Port, as described in Para. 14.11 and 14.12. An AM1 PLUS 20/20 is treated as any other AM1 PLUS Set in the chain.
D. The AM1 PLUS 20/20 is loop start <u>only</u>; it does <u>not</u> have ground start capability.
E. The AM1 PLUS 20/20 does not have Line Enable Switches (item 7 in Fig. 5-1). Originate ports are enabled/disabled with the Line Enable parameter (Para. 10.02) only.
F. There is an optional Line Cable Panel-Mount Adaptor (48-0103) for the AM1 PLUS 20/20 with two (2) 25-pair female Amphenol connectors. This Adaptor is mounted at the factory on the front panel below the line connectors. The Amphenol connector on the left contains all 20 Originate Lines and the Amphenol connector on the right contains the 20 Terminate Lines. By transposing the cables connected to these connectors, the user can simulate Call Inversion. See Table 19-1 for the pin assignments.

Table 19-1
Pin Assignments for Panel-Mount Adaptor (48-0103)

LEFT CONNECTOR, ORIGINATE LINES		RIGHT CONNECTOR, TERMINATE LINES	
25-Pair Amphenol, Female		25-Pair Amphenol, Female	
PIN NUMBERS	CONNECTIONS	PIN NUMBERS	CONNECTIONS
1 & 26	T & R Orig. Line #1	1 & 26	T & R Term. Line #1
2 & 27	T & R Line #2	2 & 27	T & R Line #2
3 & 28	T & R Line #3	3 & 28	T & R Line #3
4 & 29	T & R Line #4	4 & 29	T & R Line #4
5 & 30	T & R Line #5	5 & 30	T & R Line #5
6 & 31	T & R Line #6	6 & 31	T & R Line #6
7 & 32	T & R Line #7	7 & 32	T & R Line #7
8 & 33	T & R Line #8	8 & 33	T & R Line #8
9 & 34	T & R Line #9	9 & 34	T & R Line #9
10 & 35	T & R Line #10	10 & 35	T & R Line #10
11 & 36	T & R Line #11	11 & 36	T & R Line #11
12 & 37	T & R Line #12	12 & 37	T & R Line #12
13 & 38	T & R Line #13	13 & 38	T & R Line #13
14 & 39	T & R Line #14	14 & 39	T & R Line #14
15 & 40	T & R Line #15	15 & 40	T & R Line #15
16 & 41	T & R Line #16	16 & 41	T & R Line #16
17 & 42	T & R Line #17	17 & 42	T & R Line #17
18 & 43	T & R Line #18	18 & 43	T & R Line #18
19 & 44	T & R Line #19	19 & 44	T & R Line #19
20 & 45	T & R Orig. Line #20	20 & 45	T & R Term. Line #20
21 & 46	No Connection	21 & 46	No Connection
22 & 47	No Connection	22 & 47	No Connection
23 & 48	No Connection	23 & 48	No Connection
24 & 49	No Connection	24 & 49	No Connection
25 & 50	No Connection	25 & 50	No Connection

APPENDIX A: TECHNICAL SPECIFICATIONS

This appendix lists the Technical Specifications for the AM1 PLUS as outlined below:

- GENERAL
- ELECTRICAL
  - Originate Ports
  - Terminate Ports
  - Data Collection
  - Programmable Unit Parameters
  - Information-Only Unit Parameters
  - Programmable Line Parameters

GENERAL

DESCRIPTION: Multiple port, programmable, telephone call generator/call terminator with coincident recording of attempts, average dial-tone delay, dial tone delays, no dial tones, no rings, no confirmation tones, average post-dial delay, completions and run time data.

CONSTRUCTION: Modular, plug-in printed circuit boards in rugged portable carrying case or rack-mount card cage.

TECHNOLOGY: Microprocessor based (Z80), solid state.

DIMENSIONS & WEIGHT:

Unit	Dimensions (inches)	Net Wt.	Shipping
Portable			
AM1 PLUS	16.8L x 7.2W x 11.5H	16 lb	23 lb
AM1E PLUS	16.8L x 7.2W x 11.5H	17 lb	25 lb
AM1T1	16.8L x 7.2W x 11.5H	16 lb	23 lb
Rack Mount			
AM1 PLUS-1	19L x 7.0H x 10D	11 lb	18 lb
AM1 PLUS-2	19L x 7.0H x 10D	11 lb	18 lb
AM1 PLUS-D	19L x 5.25H x 10D	11 lb	18 lb
AM1E PLUS	19L x 5.25H x 10D	12 lb	20 lb
AM1T1	19L x 5.25H x 10D	11 lb	18 lb

L = length W = width H = height D = depth

CAPACITY: From 1 to 30 Originate and Terminate Ports (maximum capacity 450 Originate and 450 Terminate ports when chaining multiple sets).

FUSING:

AM1 PLUS & AM1T1:	110 Vac	3 A
	230 Vac	1 1/2 A
	-48 Vdc	2 A
AM1EXT-2 & AM1E PLUS-3:	-48 Vdc	2 A

POWER: 115 Vac 50/60 Hz
Optional 230 Vac 50/60 Hz, or -48 Vdc

ELECTRICAL

ORIGINATE PORTS

TYPES:	Loop start, ground start, 2 and 4-wire E&M, and T1 (DS1 1.544Mbps, 24 Channel, D3/D4 format, DSX1 levels).
CALLED NUMBER:	Up to 128 digits (0 to 9 plus *, #, A, B, C, D, KP, ST) "PAUSE" for 2nd, 3rd, etc... dial tone and wink, "WAIT," Switch Hook "FLASH," and "ESCAPE," individually programmable by line.
IMPEDANCE:	900 Ohms AC (1200 Ohms DC loop resistance simulated) or 600 Ohms AC (600 Ohms DC loop resistance simulated).
SIGNALING:	Dial pulse; multi-frequency (MF), both analog and digitally-generated; and dual tone multi-frequency (DTMF/Touch Tone), with either shared tone generator or (for loop/ground start Line Cards) with individual Line Card tone generators. Individually programmable by line with toggle capability.

TERMINATE PORTS

TYPES:	Loop start (1 R.E.N.), 2 and 4-wire E&M, and T1
INCOMING CALL DETECT:	Senses ringing (or equivalent) energy and trips ringing (shorts loop with 1200 ohms DC, 600 ohms optionally, impedance for loop ports). E&M and T1 ports perform programmed wink/delay sequence before answering.
CONFIRMING TONES, PAIRED OPERATION	Any of the following frequencies, programable by line: 1633Hz, 1477Hz, 1336Hz, 1209Hz, 941Hz, 852Hz, 770Hz, 697Hz. Voicepath confirmation may be one-way or two-way. Unit sends confirming tones before and near the end of the simulated conversation time interval.
CONFIRMING TONES, T1 UNPAIRED OPERATION	Any of the following frequencies, programmable by line: 1000HZ, 1025HZ, 1150HZ, 1275HZ, 1400HZ, 1525HZ, 1650HZ, 1775HZ, 1900HZ, 2025HZ, 2150HZ, 2275HZ, 2400HZ, 900HZ, QUIET. In unpaired operation, both the tone expected by the originate port and the tone sent by the terminate port are programmable. If the terminate port is a T1 port, any of the above tones may be selected for output. The tone will be constantly sent from terminate port off-hook until on-hook, including conversation time, if any. Only far-to-near, or one-way voicepath check can be made in T1 unpaired mode.

TERMINATE PORTS, continued

CONFIRMING TONES, ANALOG 2-WAY UNPAIRED: 1010 Hz used for either 1-way or 2-way voicepath check.

T1 PORTS: DS1, 1.544Mbps, 24 Channel, D3/D4 format, DSX1 levels, E&M signaling emulation

DATA COLLECTION

REGISTERS: There are ten (10) data collection registers for each line as listed below:

Attempts: Increments each time the originate port goes off hook and test is completed.

Average Dial-Tone Delay: Reading of average time taken for dial tone to arrive at the Originate Port.

Dial Tone Delay: Increments if first or subsequent start dials are not received within the pre-set dial tone delay threshold (1 to 30 sec).

No Dial Tone: Number of times that the originate port attempted a call wherein start dial was not received within the pre-set dial tone fail interval (1 to 30 sec).

No Ring: Number of times that a call attempt obtained dial tone, dialed its pre-programmed number but ringing, or equivalent, was not detected on terminate port in paired mode.

No Tone: Number of times that a call progressed to completion but the expected Confirming Tone (one way or both ways as selected) was not received.

Average Post-Dial Delay: Reading of average time after dialing for:
- -Ring or seizure at Terminate Port (Paired)
- -Confirmation Tone detected at Originate Port (Unpaired)

Completions: Increments if expected confirming tone(s) is received following call completion.

Run Time: Indicates accumulated run time.

Terminations: Counts the number of "Terminations" for unpaired Terminate Port lines.

REGISTER CAPACITY: Each counting register will accumulate counts to 65535 and will then wrap around to zero and begin counting again. Registers reset by "cold start" power up or "special function" keyboard command.

DATA DISPLAY: Self prompting LED 16-digit alpha numeric display used to enter/display "programmable parameters" and "data register" contents.

PRINTER OUTPUT: Optional RS232c interface available for I/O connection to Standard ASCII printer. Baud rate is switch-selectable from 110-2400 Baud (28-0005/6 Options); software-selectable from 300-9600 Baud (28-0079 Option).

PRINT INTERVAL: Automatic, nondestructive, cumulative data register printout on the hour, each hour.

EEPROM: Call parameters can be written to and read back from four (4) memory locations.

CASSETTE RECORDER: Optional RS232 and audio cassette interface available to allow for writing call parameters to and reading from tape (28-0005 Option).

PROGRAMMABLE UNIT PARAMETERS

PARAMETER	MINIMUM SETTING	FACTORY SETTING	MAXIMUM SETTING	GRANULARITY
Wait Time	1 sec	3 sec	50 sec	1 sec
Cut-Through Delay	1 sec	2 sec	25 sec	1 sec
RS232 Port Baud Rate*	300	300	9600	-----

*Choices: 300, 1200, 2400, 4800, 9600 Baud

	SETTINGS	FACTORY SETTING
Real Time Clock	24 hour time, month, day, year	0000-010100
Operating Mode	1 = Automatic Continue 2 = Automatic Stop-on-Trouble 3 = Manual	1
Call Generation	1 = Synchronous 2 = Random	2
Automatic Hourly Data Printout	1 = Enable 0 = Disable	1

PROGRAMMABLE UNIT PARAMETERS, continued

PARAMETER	SETTINGS	FACTORY SETTING
Real Time Error Report	1 = Enable 0 = Disable	0
Programmed Start and Finish Times	24 hour time, month, day, year	0000-100100
Power-On Telephone Number Recall	Select memory location 0, 1, 2, 3, or 4	0
Power-On Parameter Recall	Select memory location 0, 1, 2, 3, or 4	0
RS232 Port Parity	1 = Odd Parity 0 = Even Parity	0

INFORMATION-ONLY UNIT DISPLAYS

Last Recalled Telephone Number
Last Recalled Parameters
Software Version

PROGRAMMABLE LINE PARAMETERS
(Each parameter individually programmable by line)

PARAMETER	MINIMUM SETTING	FACTORY SETTING	MAXIMUM SETTING	GRANULARITY
Delay before Incrementing Dial Tone Delay Counter	1 sec	3 sec	30 sec	1 sec
Time allowed for arrival of Dial Tone before fail	1 sec	15 sec	30 sec	1 sec
Delay-Wink Timing* (1 to 5 times)	0 ms D 0 ms W	0 ms D 0 ms W	99900 ms D 6250 ms W	100 ms D 50 ms W
Wait for Termination (paired) or Confirmation Tone (unpaired) before Abandoning Call/Rings before Answer	1 Sec 1 Ring	10 Sec 1 Ring	50 Sec 8 Rings	1 Sec 1 Ring

* NOTE: Even though the Winks may be set as short as 50ms, the minimum duration should be 150ms. Delay "1" minimum setting should be 300ms. All Delays are spec'd at ±100ms and Winks are ±50ms.

PROGRAMMABLE LINE PARAMETERS, continued
(Each parameter individually programmable by line)

PARAMETER	MINIMUM SETTING	FACTORY SETTING	MAXIMUM SETTING	GRANULARITY
ntercall Interval	1 sec	3 sec	25 sec	1 sec
all-to-Call Time	0 sec	0 sec	1275 sec	1,5 sec
ial Pulse ate (Speed)	5 pps	10 pps	25 pps	1 pps
Break	40%	60%	80%	1%
nterdigit Pause	150 ms	600 ms	6000 ms	100 ms
i Frequency ffset	-3.5%	0% *	+3.5%	.5%
o Frequency ffset	-3.5%	0% *	+3.5%	.5%
i Frequency mplitude	-30 dBm	-6 dBm	-6 dBm	3 dB
o Frequency mplitude	-30 dBm	-6 dBm	-6 dBm	3 dB
uration On	25 ms	60 ms	99 ms	1 ms
uration Off **	25 ms	60 ms	99 ms	1 ms
onversation ime	0 sec *** 260 sec	0 sec	255 sec 1275 sec	1 sec 5 sec
tart Delay	0 sec	0 sec	255 sec	1 sec
lash Time	50 ms	500 ms	5000ms	50 ms

	SETTINGS	FACTORY SETTING
ine Enable	0 = Line Switch OFF 1 = Line Switch ON	1
rig Port	AXX, or B,C, or D 01 thru 24	AXX (XX=line #)
erm Port	AXX, or B,C, or D 01 thru 24	AXX (XX=line #)

* See notes "DUAL-TONE DIALING FREQUENCIES", at the end of this Appendix (Page A-8).

** For MF and TT Dialing Mode 1, the OFF time will always be at least the programmed "off" time. This time is extended, randomly, due to sharing the tone generator among all lines.

*** 1-5 seconds not allowed

PROGRAMMABLE LINE PARAMETERS, continued
(Each parameter individually programmable by line)

PARAMETER	SETTINGS	FACTORY SETTING
Telephone Number	Up to 128 digits. Allowable digits are 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #, A, B, C, D, KP, ST. PAUSE for second (or third, etc.) dial tone or wink, WAIT, FLASH, ESCAPE. When outpulsing MF or DMF (Digital MF), KP is entered as the * and ST is entered as the #. The KP signal tone "on" time will be twice the programmed "on" time for that line.	Blank Field
Paired or Unpaired operation	1 = Paired (PR) 2 = Unpaired (UNPR)	1
Expected Voicepath Confirmation Tone Frequency (first digit) and Direction (second digit)	Frequency Codes (first digit): 1 = 697 Hz; 2 = 770 Hz; 3 = 852 Hz; 4 = 941 Hz; 5 = 1209 Hz; 6 = 1336 Hz; 7 = 1477 Hz; 8 = 1633 Hz Direction Codes (second digit): 1 = one-way; 2 = two-way	12
Originate/ Terminate Tone	0 = 1025 Hz; 1 = 1150 Hz; 2 = 1275 Hz; 3 = 1400 Hz; 4 = 1525 Hz; 5 = 1650 Hz; 6 = 1775 Hz; 7 = 1900 Hz; 8 = 2025 Hz; 9 = 2150 Hz; A = 2275 Hz; B = 2400 Hz; C = 900 Hz; D = QUIET (Don't Care)	0-D
Supervision check	1 = No (do not check for Supervision) 2 = Yes (check for Supervision)	1
Dialing Mode	TT = 1 (factory setting) DP = 2 MF = 3 DMF = 4* TT = 4* (factory setting for loop/ground start Line Cards)	1 or 4

* "DMF=4" and "TT=4" prompts not displayed. Digitally Generated Multi-Frequency, DMF=4, only applies to T1 Originate Ports. On-board Touch Tone generator, TT=4, only applies to AM1 PLUS Analog loop/ground start line cards.

PROGRAMMABLE LINE PARAMETERS, continued
(Each parameter individually programmable by line)

PARAMETER	SETTINGS	FACTORY SETTING
Confirmation Tone Check Tries	1 to 9 tries	1

DUAL-TONE DIALING FREQUENCIES

DTMF FREQUENCIES

Hi Band	Lo Band
1633 Hz	941 Hz
1477 Hz	852 Hz
1336 Hz	770 Hz
1209 Hz	697 Hz

Hi Band Frequencies (Hz)
1209 1336 1477 1633

1	2	3	A	697
4	5	6	B	770
7	8	9	C	852
*	0	#	D	941

Lo Band Frequencies (Hz)

DTMF DIGIT ARRAY

MF FREQUENCIES

700 Hz, 900 Hz, 1100 Hz,
1300 Hz, 1500 Hz, 1700 Hz

Digit	Lo Fre	Hi Fre
1	700	900
2	700	1100
3	900	1100
4	700	1300
5	900	1300
6	1100	1300
7	700	1500
8	900	1500
9	1100	1500
0	1300	1500
*(KP)	1100	1700
#(ST)	1500	1700
(ST3P) A	700	1700
(STP) B	900	1700
(ST2P) C	1300	1700

LO Frequencies = The "Lower" of the 2 superimposed frequencies of the dual tone.
HI Frequencies = The "Higher" of the 2 superimposed frequencies of the dual tone.

APPENDIX B: COMPARISON OF MODELS AM1 PLUS AND AM1XT

B.01 INTRODUCTION

This appendix is dedicated to the AM1 PLUS user who has used or is familiar with the model AM1XT Bulk Call Generator. This appendix will endeavor to answer his often-heard question: "What are the differences between the AM1 PLUS and the AM1XT?"

Physical. The model number on the front panel of an AM1 PLUS includes the logo shown here to distinguish it from other models. The AM1XT does not have a logo.

Functional. Although there are major difference between the AM1 PLUS and the AM1XT, the models are alike in many ways. Therefore, this appendix is written with the understanding that the AM1 PLUS and the AM1XT are the same, except as noted. If a feature or capability is not mentioned in this appendix, the user can conclude that it is the same for both models.

NOTE

Comparisons in this appendix are based on the current version of the AM1XT. Older versions will not have certain features.

This appendix is divided into two (2) parts:

B.02 AM1 PLUS/AM1XT Comparison Tables
B.03 Miscellaneous Notes

B.02 AM1 PLUS/AM1XT COMPARISON TABLES

Table B-1 thru Table B-4 point out the differences between the AM1 PLUS and the AM1XT as explained below:

Table B-1: Unit Parameters Common Between AM1 PLUS and AM1XT. Some Unit Parameters are common between the AM1 PLUS and AM1XT, but differ in their method of execution. In the AM1 PLUS, Unit Parameters are set with prompts on "LINE 00", as described in Section 9; in the AM1XT, these same parameters are set with SPECIAL FUNCTIONS or use other secondary keyboard commands. The Unit Parameters affected are listed in Table B-1, along with paragraph references in this manual.

Table B-2: New AM1 PLUS Unit Parameters. There are nine (9) new Unit Parameters with the AM1 PLUS which:

A. Add variable parameters, which are fixed with the AM1XT
B. Give additional reference information

Table B-3: New/Improved AM1 PLUS Line Parameters and Data Registers. Most of these displays are new with the AM1 PLUS. Two (2) of the Line Parameters are improved to give more capability.

Table B-4: Differences in Special Functions. It is especially important to note these differences. A user familiar with the AM1XT would be rather frustrated trying to execute these Special Functions with the AM1 PLUS the same as with the AM1XT. The Special Functions not listed in Table B-4, however, are the same

Table B-1
Unit Parameters Common Between AM1 PLUS and AM1XT

AM1 PLUS UNIT PARAMETER (PARA. REF.)	AM1XT EXECUTION Items labelled with an asterisk (*) can also be executed this way with an AM1 PLUS.
REAL TIME CLOCK (Para. 9.02)	Prompt comes up: *A. With cold start Power ON B. With SPECIAL FUNCTION D
OPERATING MODE, Automatic Continue Automatic Stop-on-Trouble Manual (Para. 9.03)	*Press [SHIFT,D][4,MODE] to toggle to desired Operating Mode as indicated by MODE LEDs (above and to the right of display)
CALL GENERATION MODE Random Synchronous (Para. 9.04)	*Prompt comes up when press [SHIFT,D][4,MODE].
AUTOMATIC HOURLY DATA PRINTOUT (Para. 9.05)	Enable: SPECIAL FUNCTION A Disable: SPECIAL FUNCTION B
REAL TIME ERROR REPORT (Para. 9.06)	Enable: SPECIAL FUNCTION 8 Disable: SPECIAL FUNCTION 9
PROGRAMMED START AND FINISH TIMES (Para. 9.07)	These four (4) prompts immediately follow the Real Time Clock prompt which appears: A. With cold start Power ON B. With SPECIAL FUNCTION D

Table B-2
New AM1 PLUS Unit Parameters

AM1 PLUS UNIT PARAMETERS		AM1XT
NAME	NOTES	NOTES
WAIT TIME (Para. 9.08)	Variable, 1 to 50 sec.	Fixed at 3 sec.
CUT-THROUGH DELAY TIME (Para. 9.09)	Variable, 1 to 25 sec.	Fixed at 2 sec.
POWER-ON TEL NO. RECALL (Para. 9.10)	Select memory location	Blank field comes up @ cold start
POWER-ON PARAM RECALL (Para. 9.11)	Select memory location	Factory defaults @ cold start
LAST RECALLED TEL NO. (Para. 9.12)	For Information only	Not Applicable
LAST RECALLED PARAM (Para. 9.13)	For Information only	Not Applicable
RS232 PORT BAUD RATE* (Para. 9.14)	Programmable, 300 to 9600	DIP Switch programmable, 300 to 2400
RS232 PORT PARITY* (Para. 9.15)	Programmable	DIP Switch programmable
SOFTWARE VERSION (Para. 9.16)	For Information only	Not included

* With RS232 Port Option 28-0079

Table B-3
New/Improved AM1 PLUS Line Parameters and Data Registers

AM1 PLUS LINE PARAMETER OR DATA REGISTER NAME	NOTES	AM1XT NOTES
LINE ENABLE (Para. 10.02)	Software ON/OFF control	Only controlled with ON/OFF switch
DIALED NUMBER FIELD (Para. 10.06)	128 digits (8 fields)	48 digits (3 fields)
DIAL TONE DELAY (Para. 10.09)	Variable, 1 to 30 sec.	Variable, 1 to 15 sec.
DIAL TONE FAIL (Para. 10.10)	Variable, 1 to 30 sec.	Fixed at 15 sec.
CALL-TO-CALL TIME (Para. 10.18)	Variable, 0 to 1275 sec.	Not included
CONFIRMATION TONE CHECK TRIES (Para. 10.29)	Variable, 1 to 9 tries	Not included
AVERAGE DIAL TONE ARRIVAL TIME (Para. 13.09)	Average to nearest tenth of a second	Not included
AVERAGE POST-DAIL DELAY (Par. 13.14)	Average to nearest tenth of a second	Not included

Table B-4
Differences in Special Functions

AM1 PLUS	SPECIAL FUNCTION	AM1XT
Not used	8	Enable Real Time Error Reports
Not used	9	Disable Real Time Error Reports
Store (EEPROM)	A	Enable Auto Hourly Data Printout
Recall (EPROM,EEPROM)	B	Disable Auto Hourly Data Printout
Print EEPROM contents	D	Access Real Time Clock
Standard feature*	0	Optional feature*

* Analog Unpaired Operation with 2-way Voicepath Confirmation

B.03 MISCELLANEOUS NOTES

Line Card Tone Generators. AM1 PLUS Loop/Ground Start Line Cards have their own DTMF (Touch Tone) generator to allow all lines to dial simultaneously and greatly increase the call rate. The corresponding line cards in the AM1XT must share a common tone generator in the Basic Unit; call rate is lower than with the AM1 PLUS because the lines have to wait their turn to use the common tone generator.

Line Card Tone Detectors. AM1 PLUS Loop/Ground Start Line Cards have their own Tone Detector to decode and distinguish between Dial Tone, Line Busy and Reorder tones. AM1XT line cards do not have tone detectors, but rather share a common tone detector in the Basic Unit.

Mixing Different Models. See Para. 12.03,H for rules concerning connecting together AM1 PLUS and AM1XT units in the same Set

Analog Unpaired Operation with 2-way Voicepath Confirmation (see Para. 15.08) is a standard feature in the AM1 PLUS, but is an option (Option 25-0022) with the AM1XT.

Store and Recall. New Store and Recall functions for parameter settings are possible with the AM1 PLUS, using four (4) non-volatile EEPROM memory locations; see Para. 11.06, 11.09 and 11.10. Store and Recall of parameter settings with the AM1XT is only possible with the Cassette Recorder Option; see Para. 11.08.

Coin. Model AM1XT-C is equipped with coin accept/return voltage detection circuitry and coin deposit simulation. There is not an equivalent AM1 PLUS unit.

Baud Rate. There is a RS232 Option, 28-0079, available only for the AM1 PLUS. Baud Rate and Parity are set with Unit Parameters (see Para. 9.14 and 9.15) instead of DIP switches. Higher Baud Rate settings of 4800 and 9600 are possible with this card; these higher Baud rates are not available with the AM1XT. Maximum Baud Rate for chaining is 2400 Baud with AM1 PLUS and only 1200 Baud with the AM1XT.

New Key Function. The [3] key secondary function is "ETR ↓" in the AM1 PLUS, instead of the "→" with the AM1XT. In the AM1 PLUS, this key is used to enter a new parameter and step to the previous prompt in the display. In the AM1XT it is used to move the cursor to the right within the display.

Direct Inward Dialing (D.I.D.). The capability of a loop Originate Port to use a Wink as a start dial signal was not in the original models of the AM1XT. This capability is, however, now a standard feature of the AM1XT as well as the AM1 PLUS. This feature is necessary for D.I.D. See Para. 15.05 concerning D.I.D. operation.

The modifications to the AM1XT to incorporate Direct Inward Dialing (D.I.D.) involve both software and hardware. The D.I.D. line cards are a new design and previous line cards cannot be modified to D.I.D. AM1XT units without D.I.D. must be returned to the factory for significant hardware as well as software modifications to add the D.I.D. capability.

Note that the D.I.D.-equipped Line Card is Revision H. Revision J Line Cards do not have D.I.D. capability.

RS232 Port Commands. The commands listed below are necessary in the AM1XT to perform the indicated functions from a terminal. These commands are not necessary in the AM1 PLUS because the same functions are done with the Unit Parameter Line Enable prompt (Para. 10.02). These same commands will also work, however, with an AM1 PLUS should a user wish to use these in an existing computer program.

$X	Causes the selected line to go idle
$Y	Causes the selected line to operate under local control, i.e. run if line was enabled and unit is running

APPENDIX C: TROUBLE SHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1. Unit will not turn ON	No input power source.	Verify that proper power is applied.
	Fuse blown.	Remove front panel and check fuse on power supply module.
2. None of the Lines start	Unit not running.	Execute START command.
	None of the line enable switches are ON.	Verify that the line or port enable switches are enabled
	For Synchronous Mode: A. RS232 port connector not strapped correctly or B. Other units in chain not running or not ready to start a new cycle.	A. Verify that RS232 port is equipped with 48-0012, 48-0015 or 48-0084 cable or that RS232 Port is strapped per Fig. 14-2. Could use Terminating Plug 48-0057. B. Start other units in the chain.
3. Certain line does not start	Its line enable switch is OFF, or line enable parameter is set to OFF.	Turn on its line enable switch and/or set line enable prompt to ON.
4. Auto printout (or cassette dump) does not include lines 11-30.	None of the port or line enable switches for those lines are enabled.	Enable at least one of the switches for lines 11 - 30.
5. Printer does not work	Wrong Baud rate setting	Check switch setting on RS232 board (Option 28-0005 or Option 28-0006) or setting of Baud Rate parameter (Para. 9.14) for Option 28-0079. Make Baud Rate settings the same with the AM1 PLUS and the printer.

	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
6.	Completion registers do not increment	Calls are not completing to the correct port	Verify that the dialed number as programmed is the correct number of the Terminate Port, if paired operation is selected. Verify the O-T tone param. if unpaired to be sure that the Originate Port is expecting the correct frequency. Listen for ringing voltage on the Terminate Line with the Audio Monitor. If has RS232 Port, enable Real Time Error Reports for details of why failure is occurring. Observe other Data Register incrementation for clues.
		Supervision check parameter is enabled and not received.	Verify status of "SUP CK" parameter and whether or not answer supervision is being received
7.	LED display shows "garbage"	CPU Board is defective	Check CPU Board connection

APPENDIX D: MAINTENANCE CONSIDERATIONS

D.01 INTRODUCTION

In routine operation, there is no need to remove the front panel of the AM1 PLUS. There are some maintenance procedures, however, for which it is necessary to remove the front panel. This appendix covers these maintenance procedures with paragraphs as listed below:

D.02 AM1 PLUS Calibration Statement
D.03 Front Panel Removal and Printed Circuit Board Location
D.04 Procedure to Update Software
D.05 Replacement of CPU Memory Battery
D.06 Setting RS232 Port DIP Switches
D.07 Inspection/Replacement of Power Supply Fuse
D.08 Setting of Address on Analog Line Cards
D.09 Modifying Line Card Impedance for 600/1200 Ohms

D.02 AM1 PLUS CALIBRATION STATEMENT

Some customers have periodic calibration done on all their equipment to meet company or contractual standards. The AM1 PLUS, however, does not need periodic calibration. The statement below is to explain to those in charge of calibration inspection why there is no need for AM1 PLUS periodic calibration.

CALIBRATION STATEMENT

Ameritec does not recommend periodic calibration of the AM1 PLUS.

The AM1 PLUS has been designed to operate accurately without calibration. This is evidenced by the fact that there are no adjustments in the AM1 PLUS.

Some pertinent characteristics of the AM1 PLUS:

1. All lines are independent.
2. In some dialing modes, the tone generator and tone detector are shared between the lines.
3. All frequencies are derived from a crystal oscillator.
4. If for some reason the AM1 PLUS were unable to accurately dial DTMF, all calls would fail confirmation check.

D.03 FRONT PANEL REMOVAL AND PRINTED CIRCUIT BOARD LOCATION

1. Remove power cord.
2. Remove line cables.
3. Remove volume knob.
4. Using #2 Phillips screwdriver, remove four (4) 6/32 Phillips-head front panel retaining screws.
5. Remove front panel and place to the side of work area.
6. Note location of printed circuit boards as shown in Fig. D-1.

D.03 FRONT PANEL REMOVAL AND PRINTED CIRCUIT BOARD LOCATION

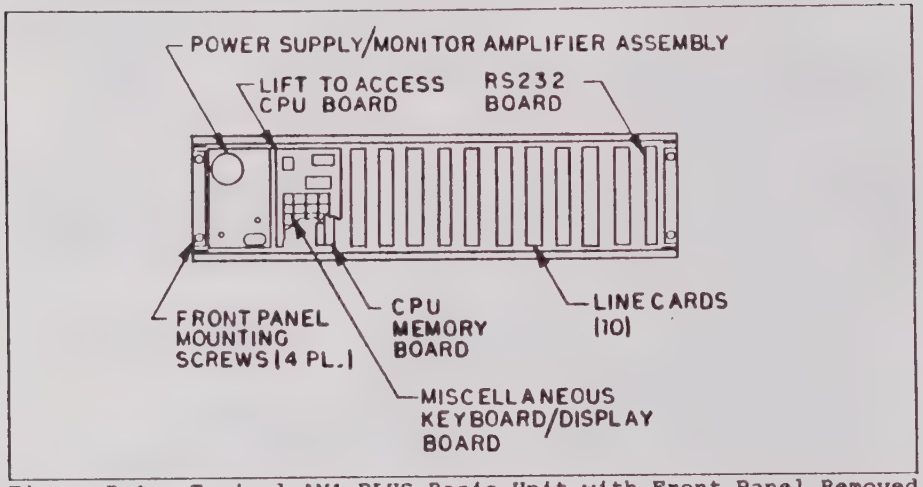


Figure D-1. Typical AM1 PLUS Basic Unit with Front Panel Removed

D.04 PROCEDURE TO UPDATE SOFTWARE

NOTE: Para. 9.16 display indicates version of software installed.

1. Remove front panel per Para. D.03.
2. CPU/Memory Board location/removal
   - A. Lift hinged keyboard as indicated in Fig. D-1.
   - B. The keyboard will swing out to reveal the CPU/ Memory Board (with circular battery on the edge).
   - C. Disconnect the black connector (near the battery).
   - D. Carefully remove CPU/Memory board from its card slot.
   - E. Locate EPROM on the CPU/Memory board. It will have a white label to identify the program version.
   - F. Note orientation of the polarity notch on the EPROM.
   - G. Carefully remove EPROM with an IC puller.
3. Placement of new software
   - A. New EPROM will be marked with the program version.
   - B. Insert the new EPROM carefully into the socket with the same orientation as noted in Step 2F. Be sure no pins of the IC are bent or broken.
   - C. Reconnect the black cable near the battery. The connection can be oriented either way as this cable is not polarity sensitive.
   - D. Reinsert the CPU/Memory board into its card slot. Be sure component side is facing the power supply.
4. Testing software change:
   Once CPU/Memory board is re-installed, power up the AM1 PLUS. The display should show the CLOC prompt of the Real Time Clock. See addendum with the new software for operating instructions of the software.
5. Once the unit has been verified to be working properly, re-install the Front Panel and volume control. Do not force the front panel into place as the Interface Boards or Display Board could be damaged.

D.05 REPLACEMENT OF CPU MEMORY BATTERY

The AM1 PLUS has a 3.9 Vdc Lithium Battery (Model 18-0001), located on the CPU/Memory Board (Model 28-0033), which provides for battery-backed memory in the event of power outages. This battery will provide a minimum of 500 hours of battery-backed memory. See Para. 11.03 for description.

To replace the CPU Memory Battery:

1. Order replacement battery, Model 18-0001
2. Remove front panel per Para. D.03.
3. Locate the old battery on the CPU/Memory board; see Para. D.04 for instructions to remove the CPU/Memory board.
4. Cut tie-wrap holding down old battery.
5. Unplug old battery, noting the orientation.
6. Plug in new battery (3 prongs) in the same orientation.
7. Secure with tie-wrap (supplied with the battery).
8. Replace CPU/Memory board and re-install front panel.

D.06 SETTING RS232 PORT DIP SWITCHES

With RS232 Port Options 28-0005 and 28-0006 it is necessary to remove the front panel of the Basic Unit to access the DIP switches used to set the Baud Rate, Parity and Stop Bit. See Para. 14.04 for DIP switch settings.

NOTE

Do not remove the front panel to make settings with RS232 Port Option 28-0079. Settings are made with Unit Parameter prompts shown in Para. 9.14 and Para. 9.15.

To access the RS232 Port DIP switches:

1. Remove front panel per Para. D.03.
2. Locate the RS232 Board (see Fig. D-1).
3. Remove the RS232 Board from its card slot.
4. Locate the 8-position DIP switch on the RS232 Board.
5. Set the DIP switches per Fig. 14-1 and Table 14-1.
6. Replace RS232 Board and re-install front panel.

D.07 INSPECTION/REPLACEMENT OF POWER SUPPLY FUSE

1. Remove the front panel per Para. D.03.
2. Locate the Power Supply/Monitor Amplifier Assembly as shown in Fig. D-1.
3. Remove the Power Supply Assembly from its card slot.
4. Locate the black fuse holder on the right side of the Power Supply Assembly.
5. Unscrew the fuse holder cap and remove the fuse.
6. Replace with new fuse if present fuse is blown.
7. See Table 3-1 for fuse values.
8. Reverse above procedure to reassemble.

D.08 SETTING OF ADDRESS ON ANALOG LINE CARDS

Normally, there is no need to set the address DIP switches on the Analog Dual-Port Line Cards; the address DIP switches are set correctly at the factory. However, if an Analog Line Card is replaced or moved to another card slot, the address DIP switches must be set to match the line number of the card slot in which the card is installed.

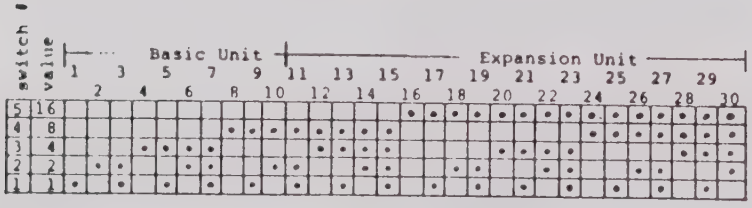
NOTE

Digital T1 Span Interface Cards do not have address DIP switches. Each card knows automatically in which slot it is installed.

To set the Address DIP switches on an Analog Line Card:

1. Remove the front panel per Para. D.03.
2. Remove the line card to be replaced and determine the line number of the slot in which the new line card is to be installed.
3. The address set on the DIP switches must correspond to the line number of the card. For example, the card installed in the slot for line 15 must be set with the address "15".
4. Reference Fig. D-2 and locate the address DIP switch on the line card. It is a 5-position DIP switch located in the lower left corner of the line card. Several types of 5-position DIP switches have been used in production, but all contain five (5) discrete switch actuation bars which will either operate as rocker switch bars or slide switch bars. The individual switches will be labeled from bottom to top as 1,2,3,4,5, or 1,2,4,8,16. The switch closed position will be labeled either "ON" or "CLOSED". The switch open position may be labeled either "OFF" or "OPEN".
5. Set the switches in accordance with Table D-1.
6. Install card in the correct slot that matches the address set on the card.
7. Re-install the front panel.

Table D-1
Analog Line Card Address DIP Switch Settings



A dot (·) indicates that the corresponding switch should be in the "ON" or "CLOSED" position. Note that the sum of the value of the "ON" switches equal the card position number.

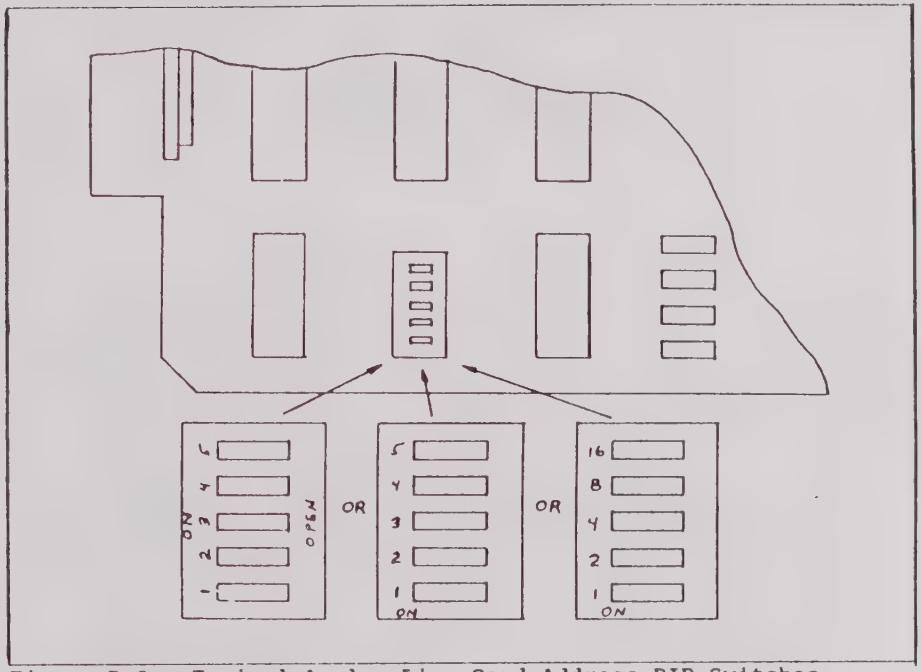


Figure D-2. Typical Analog Line Card Address DIP Switches

D.09 MODIFYING LINE CARD IMPEDANCE FOR 600/1200 OHMS

The loop resistance at each port of an Analog line card is either 1200 Ohms (standard) or 600 Ohms (optional) as explained in Para. 5.06.

Reference item 7 in Fig. 5-1:

A. If the loop resistance is 1200 Ohms, there is a BLACK rubber boot on the Originate Port enable toggle switch.
B. If the loop resistance is 600 Ohms, there is a BLUE rubber boot on the Originate Port enable toggle switch.

Normally:

1200 Ohms loop resistance is associated with a 48-volt line &
600 Ohms loop resistance is associated with a 24-volt line.

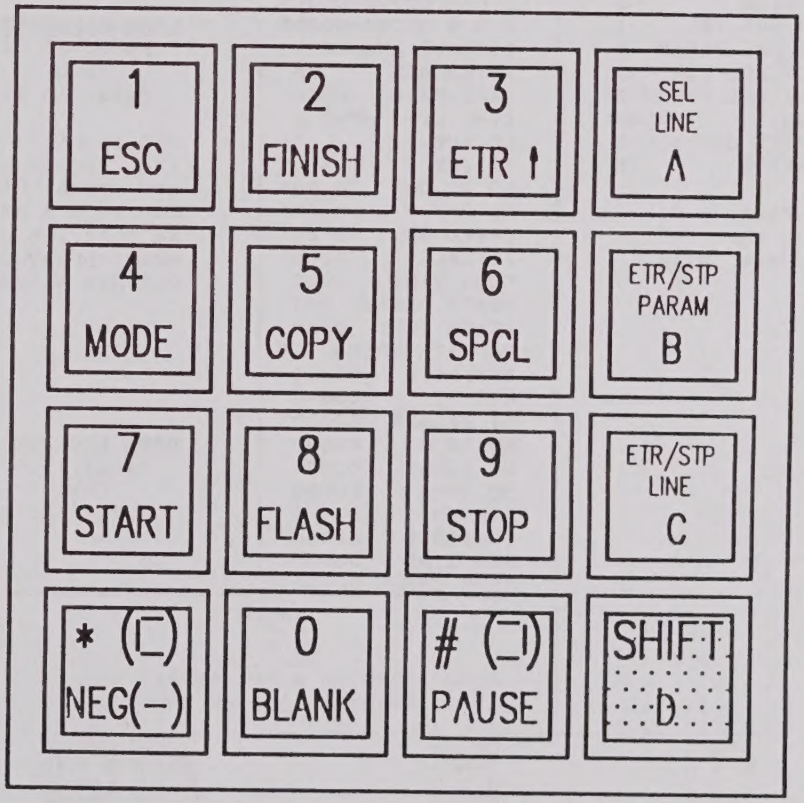
It may be desired to change the loop resistance of the standard line card (with 1200 Ohm loop resistance) to 600 Ohms in order to make it compatible with a 24-volt line. The modification can be done with four (4) resistors, two (2) of one value and two (2) of another value. The resistors are connected in parallel with the same-value resistors already installed on the line card.

Soldering the resistors to the line card as mentioned above would void the warranty. If such a modification is nonetheless desirable, consult the factory for details.

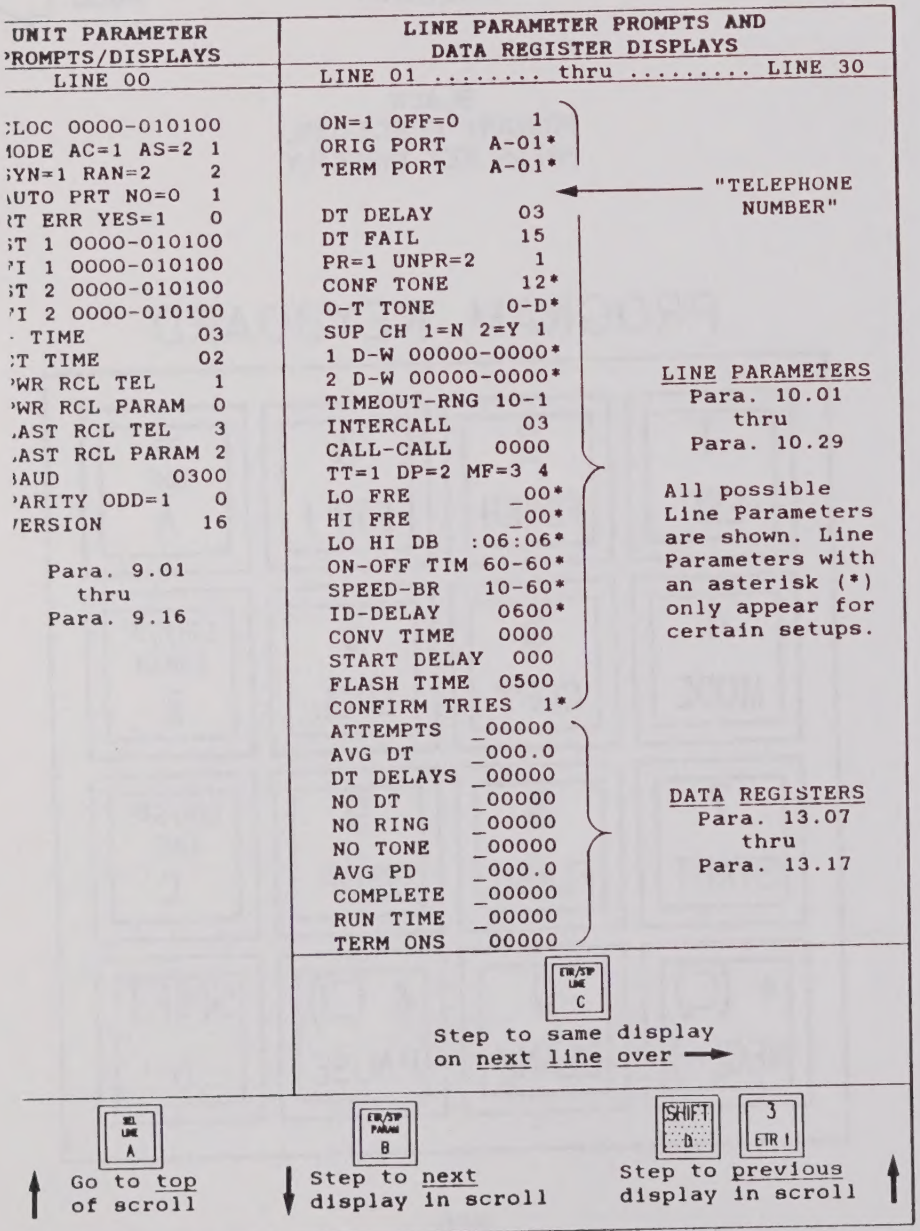
FOLDOUT PULL

BLACK
PRIMARY FUNCTIONS.
PRESS KEY DIRECTLY

PROGRAM KEYBOARD



RED
SECONDARY FUNCTIONS.
PRESS AND RELEASE [SHIFT, D] ,
THEN PRESS THE KEY.



igure 4-3. Display Array: Parameter Prompts and Data Registers

MP MASTER
MA25555